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SUITABLE ELECTRIC WIRING IN THE HOME.

When one considers the remarkable development which has taken place in electrical appliances in the course of ten, or even of five years, and especially in devices for domestic application and household use, it seems evident that the wiring of the home for electric service should be done with a view to a similar development in ensuing years. In other words, so far as possible, provision should be made for a demand for electric service far in advance of that which may be represented by the current-consuming household devices now upon the market.

On the contrary, however, one finds homes being designed and wiring installed which, instead of being ahead of the immediate requirements of today, are not even up to date, but rather along the lines which would represent conditions five or ten years in the past. Not only are the facilities for lighting equipment seldom adequate to provide for modern ideas along this line, but there is an almost total lack of provision for other appliances already coming into quite general use.

Architects seem sadly behind the time in the facilities which they recommend, or fail to recommend, for the convenient utilization of electric service. Contractors, too, are often at fault in this regard, and generally show too great a willingness to put in the most simple equipment which the owner may suggest, instead of giving him wholesome advice regarding the position of outlets, the provision of switches, and other items of detail which will be impressed all too strongly upon him after the installation is completed and has been in service for a few months. When the home owner gets an interest in various household appliances, as he is almost sure to do sooner or later, he becomes painfully aware of the lack of facilities for connecting up and using the various devices which are becoming more and more customary in the home.

This condition, coupled with some good suggestions for home equipment, was brought out in the address by Mr. F. B. Adam before the St. Louis Jovians, which appears elsewhere in this issue. The remedy for this condition seems to be for those who are interested in the use of electric appliances and in having them give satisfaction to get in touch with the owners of new buildings before the plans are completed and show them the desirability of an electrical installation which will be in conformity with their future requirements. The manufacturer, the contractor, the central-station man, and indeed every other element in the electrical industry, should take a live interest in this question and

endeavor to encourage the building of homes provided with really adequate electrical wiring. Such wiring is at present the rare exception. There is nothing that the Society for Electrical Development can do which will in the end prove more fruitful in furthering its objects than to start an educational campaign among the public with the object of informing the home builder as to what his future requirements will be in this line. It is not sufficient to stimulate the desire for the possession and utilization of electrical apparatus; means must be provided for their safe and convenient use.

The common neglect with which architects approach this problem is well illustrated by an instance cited upon page 652. Very frequently the details of the electrical installation in the small home are left to the judgment of the electrical contractor and much could be done by this element of the industry by making a real study of future requirements and impressing upon the house owner his future needs. These would not only help to develop the industry and produce greater satisfaction among customers but would increase the business of the contractor as well.

KEEPING CONCRETE OUT OF THE CONDUIT.

Most electricians who have had experience in wiring reinforced-concrete buildings know of the difficulties due to the presence of concrete in conduits sometimes encountered when the circuits are being pulled into concealed work in such a building. It is a rather frequent occurrence for blocks of this material to be found in pipes which completely obstruct the passage of the wires and are very hard to remove. In fact once in a while a circuit may have to be abandoned because the obstruction cannot be removed at all.

Troubles of this kind have led some electricians to the conclusion that provisions ought to be made for draining the conduits in buildings of the type under consideration. They argue that the concrete is carried into the conduit by water which finds its way there while the concrete of the floor, or whatever other part of the building it may be, is setting, and that the conduits should be so installed that this water would drain out and carry the cement which it holds in suspension with it.

The subject of draining conduits will not be gone into here, further than to make the suggestion that the possibility of anything like satisfactory draining in a building of the average type is a thing that is exceedingly doubtful. It would seem that what is needed most is the exercise of greater care by wiremen to prevent water from entering the conduits. When any considerable amount of it gets into a run of pipe during the work on the building this is rather conclusive evidence that exposed ends of pipes have been left open, that joints have not been properly made, or that careless workmen have partially broken joints after the electricians have left them. All joints having been properly threaded and leaded, the couplings put on carefully, and exposed ends of tubes closed up in the right way, it is hard to see how water could enter the conduit in harmful quantities. It is no great job to make a line of piping watertight. Any good plumber can do it.

WOODWORKING PLANTS AS CENTRAL-STATION CUSTOMERS.

While it can hardly be said that the saturation point is being reached in central-station power business, still the time is gradually approaching when the business that was neglected for that which was easier to secure must be considered. Of the industries coming in this category the most important and by far the greatest in point of number of plants are the various woodworking industries. Certainly very gratifying progress has been made in converting these establishments to central-station power, but the field is a vast one and a majority of the plants are still in the group that remains to be changed over.

The facts of the case are that steam is necessary for dry kilns during the entire year and for heating, in many plants, during the winter months. Also, refuse varying in amount with the size of the plant, is available for fuel, so that in some of the larger establishments very little if any coal need be purchased. In some few places the local market is kept supplied with shavings and kindling and still enough refuse remains to keep the coal bill at a minimum. Obviously the task of the central station in securing this class of business is a difficult one and likewise it is not strange that managers of woodworking plants of the kind referred to are at a loss to see wherein central-station service can save them money, as some optimistic salesman may have tried to make them believe.

It can be said, however, that many managers of woodworking plants, because of the availability of waste, refuse to consider power from an outside source without even inquiring as to the possibility of selling this material. An illustrative case may be cited, the manager of this particular plant believing that by burning the waste just as rapidly as it could be collected from the factory he was saving just so much in fuel. After several unsuccessful attempts, the power company's representative was allowed to analyze conditions and found that the cost of the coal burned at night would pay the entire power bill. Central-station service was bought, the refuse so conserved that it would supply all steam for dry kilns, and the excess was sold, readily, at a good profit.

Undoubtedly there are many plants where the same or similar conditions would be found to exist, but even then the field would be far from covered. The utilization of waste is the point upon which the whole question hinges. At frequent intervals announcements are made by engineers and scientists, working independently, relative to the successful distillation of wood, and it is now believed that it is com-

mercially feasible. It would seem that owing to the importance of this subject from the central-station point of view, some organized effort should be extended by the electrical fraternity, preferably the National Electric Light Association, looking to the thorough investigation of the possibilities in wood distillation in particular, and the utilization of wood waste in general. The woodworking industry would co-operate and those now engaged in the work would welcome the moral and financial support from this source.

Surely if the question could be satisfactorily solved the concrete benefits would be most widely felt among central stations.

ELECTRICITY AND THE GASOLINE AUTOMOBILE.

The increasing use of electricity for auxiliary service on gasoline automobiles is one of the most gratifying tendencies of the motor-vehicle industry. It is significant that most of the high-class cars exhibited at the automobile shows this year are equipped with electrical starters, and the improvement in electric lighting service apparent in the latest designs of limousines, touring cars and runabouts clearly shows that illumination by incandescent lamps of the tungsten type is being more and more demanded by discriminating purchasers. Entirely apart from the development of the electric vehicle itself, this growing appreciation of the value of electricity as an auxiliary in the convenient and reliable operation of a high-powered and costly automobile is a double benefit to the electrical industry, since it educates the car owner while increasing the revenue of the accessory manufacturer, thereby establishing an open mind on the part of the former and those who share his car's service toward the wider use of electrical apparatus in other spheres of life.

Electric lighting is so familiar to those interested in its application to automobile service that only passing mention need be made of it in connection with the specialization of motor service for engine starting. This is the latest and most notable application of electricity on the gasoline car, and within the past two or three years a great variety of systems have been developed to meet the requirements of the automobile manufacturers.

The inability of the automobile to start without manual cranking has been one of its weak points until lately. Hand cranking is tiresome, dangerous, inconvenient and inefficient; a coiled spring can furnish power for cranking only and its energy will turn the engine over only a few times; and while compressed air can be used for tire inflation as well as for cranking, the amount of energy which can be stored in a tank of moderate size and weight is not great. On the other hand, a 60-pound automobile starting and lighting battery of a well known standard make can deliver nearly two million foot-pounds of energy, sufficient to raise its own weight to a vertical height of about 6 miles, while a coiled spring to store this energy would have to weigh some four tons and a tank of compressed air at 150 pounds pressure over one ton. Hence the storage battery, despite its rather low efficiency compared with generators, motors and transformers, is vastly superior to these other agencies, and a group of cells of small size will crank an engine for many hundred starts, operate it for short periods in emergencies on crowded thoroughfares or railroad crossings, will light the car lamps, furnish ignition current and run an electric horn or signal with the utmost reliability and convenience.

The way in which these applications of electricity to the gasoline car have been worked out in detail in so short a space of time challenges the admiration of the engineer. It is only one more illustration of the wonderful flexibility of electrical methods and the resources of the electrical designer, but it is a distinct achievement from the manufacturing standpoint. It is safe to say that electric cranking is in use on 70 per cent of those which are mechanically started. Space will not permit a comparative discussion of individual systems, but it is noteworthy that some of those now on the market embody principles and designs of the greatest engineering interest and economic value. Thus, in one case, the armature of the starting motor is substituted for the flywheel of the engine, the machine being run as a generator for lighting and battery charging when the car reaches a certain speed, without gears, clutches, sprocket chains, bearings or added weight of any kind.

In another, a separate starting motor is used, with an independent generator for battery charging, lighting and other service, and in this case high efficiency is the natural result of apportioning the electrical parts of each machine to its own peculiar work. A specialized motor for starting only seldom runs more than a few seconds or minutes at a time and for this reason may be designed to develop a more rapid acceleration and a greater speed and power output for a given energy consumption than one in which heating limitations are in evidence on account of the more constant service demanded. Specially ingenious also are the various arrangements in force for governing the operation of the charging generator through extreme ranges of speed in the car itself, so that the battery shall not be overcharged or the lamps subjected to abnormal voltages.

The problems of the automobile are thus in large measure those of train lighting, and one of the chief reasons why the equipments in service are so satisfactory is the care taken by manufacturers to insure reliable and accident-proof wiring and connections. A critical study of these details will go far to convince the experienced electrical man that the mechanical side of electrical auxiliary equipment on the gasoline automobile is receiving the same sort of attention that is given to heavier switchboard and regulating apparatus familiar to the central-station industry, and the reward of such work is reliable service.

Colorado Electric Show Plans.

The Colorado Electric Club, which intended presenting a statue of Thomas A. Edison to the City of Denver at the opening of its third annual electric show next October, has been unable to get the consent of Mr. Edison to pose for the work. Mr. Edison said that while he appreciated the compliment which the Colorado electrical men were eager to bestow upon him, he preferred that no statue of him be erected while he is living.

When Mr. Edison declined to sit for the statue, the committee in charge of the electrical exposition immediately set about forming other plans. It was decided that in view of the fact that the electric show was being given to raise funds to finance the "Last Grand Council of the North American Indians" which will be held in Denver in 1915, a statue portraying some feature of the peace which has finally come between the Indian and the white man would be most appropriate.

As a result of this suggestion, the Committee will ask W. F. Cody, popularly known as "Buffalo Bill," one of the most noted Indian fighters and scouts of the early west, to sit as the chief figure in a group which probably will be known as "Peace." The other figures will be posed by a number of noted Indian chiefs, who took part in the Indian wars in early days or are direct descendants of them.

Henry Newman, a distinguished New York sculptor, has been commissioned to make the group, which will cost $10,000. After it is completed it will be donated to the city and probably will be erected opposite to the spot now occupied by the Kit Carson pioneer monument in the Civic Center grounds.

The unveiling will take place the night the electric show opens. Impressive ceremonies will be held in which Colonel Cody and James Thorpe, the noted Indian athlete, who will probably be asked to pose as part of the group, will take a part. Governor Ammons, Mayor Arnold and other city and state officials will take part in the services which will mark the unveiling of the monument.

Space for exhibition purposes in the show has been in big demand, and although the prospectus for the show has not been printed and distributed as yet, a number of the large electrical companies have already expressed their willingness to take space in the exposition hall. Judging from the demand already made for space it will be disposed of more quickly this year than in former years.

The various committees of the Electric Club are now working to complete the plans already formulated and as the show is being given to raise a fund to advertise and promote the "Indian Pageant of America," practically every one in Denver is working for the success of the show. It is expected that the attendance at the 1913 exhibition will outstrip the marks set by other shows, as the price has been reduced and it really affords every citizen of Denver an opportunity to contribute a small amount to the Indian festival, at the same time getting value for his money.

At the regular weekly luncheon of the Electric Club, held at the Albany Hotel on March 13, John M. Dowen, superintendent of the George W. Clayton College, gave an interesting talk on that institution.

New York Section Sees Snakes.

About 400 persons were present at the first ladies' night of the New York Companies' Section of the National Electric Light Association, held in the Auditorium, 44 West Twenty-seventh Street, on the evening of St. Patrick's Day.

Raymond Ditmars, of the New York Zoological Gardens, gave an illustrated lecture concerning "Reptiles" and his experiences in capturing most of the specimens in the Bronx Park's remarkable collection. Mr. Ditmars had with him several suit cases of live snakes and with the assistance of William Snyder, head keeper at the Zoo, illustrated to his audience the dangers of handling poisonous snakes and just how these dangers were overcome.

The famous trio of Edison entertainers, Abbott, Cook, and Tydd, then held forth in songs and clog dances. Refreshments were served and the crowd busied themselves with the pleasant occupation of renewing and making acquaintances.

It is planned to hold another entertainment and ladies' night at the meeting of the Section on June 19.

Chicago Electric Club.

The regular weekly meeting of the Electric Club of Chicago on March 20 was addressed by J. C. McDonald, assistant fire marshal and chief of the Bureau of Fire Prevention and Public Safety of Chicago, Ill. The Fire Prevention Bureau was organized last August. Mr. McDonald told of the splendid work which it is doing.

At the meeting on March 13 the subject of permanent club quarters was discussed and finally dropped, and the president was instructed to appoint a committee to consider the feasibility of joining in a co-operative movement with other similar organizations for the separate use one day each week of some suitable rooms for a luncheon meeting.

Program of Meeting of Mississippi Electric Association.

The annual convention of the Mississippi Electric Association will be held at Natchez, Miss., April 21, 22 and 23. Members of the Association will gather at Vicksburg on April 21, and a steamboat has been chartered to take the party from Vicksburg to Natchez, leaving at noon on Monday.

The convention will be opened on Monday afternoon on board ship. The president's address and the reports of the Committee on Electric Heating and Cooking and the Committee on Meter Testing and Practice will be presented at this session.

Morning and afternoon sessions will be held on Tuesday and Wednesday at Natchez. There will be reports by the Committee on Line Construction, Committee on Grounding of Secondaries, Committee on Insurance, Committee on Public Policy, and the usual business committees. There will also be the following papers: "Large Power Contracts," by A. B. Paterson; "Single-Phase Motors," by J. F. Jones; "Lubricating Oils," by W. A. McWhorter. There will be other papers not yet arranged, including one on "Ornamental Street Lighting in Small Cities."

Entertainment features will include sightseeing in Natchez, a bridge party on Tuesday afternoon for the ladies, a reception and dance at the Prentiss Club on Tuesday evening and a banquet on Wednesday evening. Preceding the reception on Tuesday evening there will be a Jovian rejuvenation. There will also be some special entertainment features on the boat trip.

March Meeting of Directors of American Institute.

The Board of Directors of the American Institute of Electrical Engineers held its regular monthly meeting in New York City on March 14. Twenty-three members were transferred to the grade of fellow, 51 associates were transferred to the grade of member, 100 associates were elected and 102 students enrolled.

The organization of a branch at the Rhode Island State College, Kingston, R. I., was authorized.

The report of the Tellers Committee on nomination ballots was read and the Board made up a list of Directors' nominees, as published in our last issue.

California Contractors to Meet at Santa Barbara.

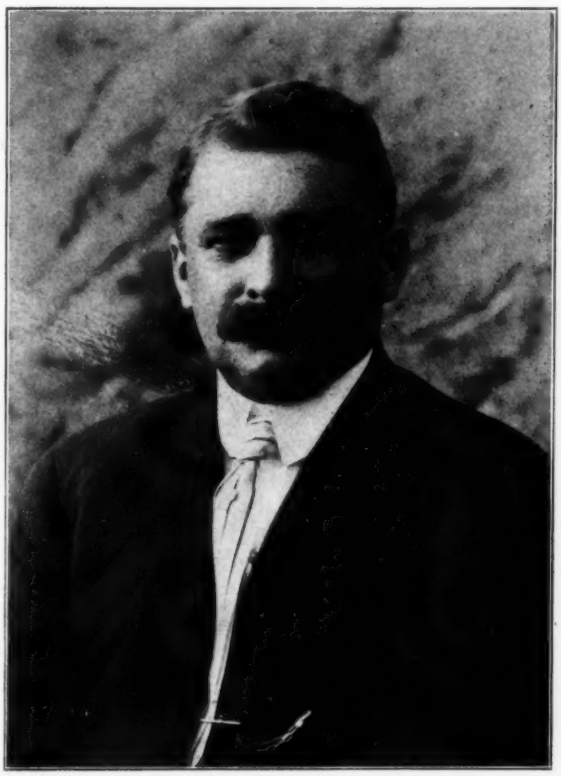
The California State Association of Electrical Contractors will hold its convention this year at Santa Barbara during the week of August 13. The secretary of the Association is W. S. Hanbridge, of San Francisco.

S. W. Stratton.

The National Bureau of Standards, Washington, D. C., is one of the most important institutions conducted by the Government of this country. The work of this institution has been of the greatest benefit to science and industry. It is one of the most active and successful organizations of its kind in the world. Its work is not simply the construction and comparison of standards—it has a highly trained scientific staff which is engaged in the working out of scientific and technical problems of every character. The organization and direction which have made for the success of this institution is largely due to the efforts of the subject of this sketch, S. W. Stratton.

Samuel Wesley Stratton was born at Litchfield, Ill., July 18, 1861, the son of Samuel and Mary B. (Webster) Stratton. He received the degree of Bachelor of Science from the University of Illinois in 1884, and the degree of Doctor of Engineering from this institution in 1903. He received the degree of Doctor of Science from the Western University of Pennsylvania, in 1903, and the same degree from Cambridge in 1909. He was instructor in mathematics, assistant professor and professor of physics and electrical engineering at the University of Illinois from 1885 to 1892. He was assistant, associate professor of physics at the University of Chicago from 1892 to 1901. He has been director of the Bureau of Standards since 1901. He has seen military service, and was ensign, lieutenant, junior grade, lieutenant and lieutenant-commander of the Illinois Naval Militia from 1895 to 1901. During the Spanish-American War, from May to November, 1898, he served in the United States Navy, and he has been commander of the District of Columbia Naval Militia since 1904. He is a member of the International Commission on Weights and Measures, an associate of the American Institute of Electrical Engineers, and a member of its Standards Coimmittee, a member of the American Physical Society, the American Philosophical Society, the American Association for the Advancement of Science, and the Astronomical and Astrophysical Society.

Dr. Stratton was awarded the Elliott Cresson medal by the Franklin Institute on May 15, 1912, for his work in promoting scientific accuracy in the production of standards for scientific and industrial application. He has just become a member of the Council of the Underwriters' Laboratories of Chicago, bringing to this important institution his great experience and ability in the formulating of scientific methods for the testing of material of every description with a view to the elimination and prevention of fire risks in construction of every description.



S. W. Stratton,
Director of the National Bureau of Standards.

Baltimore Jovian Luncheon.

Frank E. Watts, of New York, the eleventh reigning Jupiter of the Jovian Order, was the speaker at the weekly luncheon held by Baltimore Jovians on March 20. Mr. Watts took as his subject "The Growth of the Jovian Order Within the Past Few Years." Fully 100 members and friends were present. Melvin H. Jones, Maryland statesman, presided. The next rejuvenation of Maryland will be held on April 25 and all of the present members are enthusiastic in making this rejuvenation the largest to be held for some time in Baltimore.

Spring Meeting of Mechanical Engineers.

The spring meeting of The American Society of Mechanical Engineers will be held on May 20 to 23 in Baltimore.

Program of Convention of Electrochemical Society.

The regular annual meeting of the American Electrochemical Society will be held at Alantic City, N. J., on April 3, 4 and 5. The Hotel Traymore will be headquarters. Sessions for the reading of papers will be held Thursday morning, Thursday afternoon, Saturday morning and Saturday afternoon. On Friday an excursion will be made to Philadelphia and visits of inspection will be made to the works of the Crucible Steel Casting Company, Harrison Brothers Chemical Company, and United Gas Improvement Company. On Friday evening there will be a lecture by Frank B. Kenrick, of Toronto, on "Hyperbasis." This will be followed by a smoker. The business meeting will be held on Thursday morning and the president's address will be delivered on Saturday morning.

The following papers will be presented: "Conduction and Radiation of Heat," by I. Langmuir; "Experiments with Furnace Electrodes," by F. A. J. Fitzgerald and A. T. Hinckley; "Aluminium Nitride," by J. W. Richards; "Some Tests of the Edison Storage Battery," by C. W. Bennett and H. N. Gilbert; "Concentration Cells Containing Organic Liquids Immiscible with Water," by R. Beautner; "Concentration Changes in Copper Sulphate Electrolysis," by C. W. Bennett and C. O. Brown; "The Three-Phase-Two-Phase Induction Furnace," by A. E. Greene; "Making Electric Steel Without Slag," by A. E Greene; "Electrodeposition of Gold and Silver," by Francis C. Frary; "Electrodeposition of Copper." by C. W. Bennett; "Electrodeposition of Brass and Bronze," by C. W. Bennett; "Electrodeposition of Cobalt and Nickel," by O. P. Watts; "Electrodeposition of Lead," by F. C. Mathers; "Solid, Thick Lead Cathodes from Lead-Acetate Solutions," by F. C. Mathers; "Solid Thick Lead Cathodes from Lead-Lactate Solutions," by F. C. Mathers and B. W. Cockrum.

Seattle Jovian Luncheon.

The Seattle Jovian League held its regular weekly meeting and luncheon at the Rathskeller, Seattle, Wash., on March 14. The organization was addressed by Thomas Davies, port warden, on the volume of business coming in and going out of the Port of Seattle.

Allis-Chalmers Reorganization.

The properties of the Allis-Chalmers Company in Wisconsin have been purchased on behalf of the reorganization committee at public sale pursuant to the decree and order of the United States District Court, at Milwaukee, in the foreclosure and administration suits, and the sales have been confirmed by orders of the court, entered March 7, 1913.

The new company has been organized under the name of Allis-Chalmers Manufacturing Company, with preferred and common stock as provided in the plan and agreement of reorganization dated March 18, 1912. It is expected that the remaining properties in Illinois, Pennsylvania and California will shortly be acquired on behalf of the reorganization committee.

The board of directors of the new company has been elected as follows: Otto H. Falk, president, Milwaukee; Oliver C. Fuller, president Wisconsin Trust Company, Milwaukee; J. D. Mortimer, president Milwaukee Light, Heat and Traction Company, Milwaukee; Gustave Pabst, president Pabst Brewing Company, Milwaukee; Fred Vogel, Jr., president First National Bank of Milwaukee; Max Pam, Chicago; F. O. Wetmore, vice-president First National Bank, Chicago; John H. McClement, chairman of the Board, New York; Arthur W. Butler, of Butler, Herrick & Kip, New York; Charles W. Cox, of Robert Winthrop & Co., New York; Oscar L. Gubelman, of Knauth, Nachod & Kuhne, New York; R. G. Hutchins, Jr., vice-president National Bank of Commerce, New York; Arthur Coppell, of Maitland, Coppell & Co., New York; William C. Potter, vice-president Guaranty Trust Company of New York; and James P. Winchester, president Wilmington Trust Company, Wilmington, Del.

The certificate of incorporation provides that the holders of the preferred stock shall have power to elect a majority of the directors.

The board of directors has appointed an executive committee consisting of Mr. Vogel, chairman, and Messrs. Falk, Fuller, Mortimer and Pabst.

As provided in the plan of reorganization, five voting trustees have been appointed to hold the preferred and common stock, except the qualifying shares of directors, under a voting trust agreement, which is to last for five years unless sooner terminated by the voting trustees in their discretion. The voting trustees are Messrs. James N. Wallace, chairman; Charles G. Dawes, Alexander J. Hemphill, W. Emlen Roosevelt and Henry F. Whitcomb.

The properties will be taken over by the new company and operations conducted under the new management at an early date.

Notice has been given to holders of certificates of deposit for preferred and common stock that the reorganization committee, pursuant to the terms and provisions of the plan and agreement of reorganization, has called for payment the balance of the amount due on their assessments in two installments, viz.:

1. In respect of each share of preferred stock, $4 per share on or before April 24, 1913, and $4 per share on or before May 15, 1913.

2. In respect of each share of common stock, $2 per share on or before April 24, 1913, and $2 per share on or before May 15, 1913.

Payments must be made to the Central Trust Company of New York, depositary, No. 54 Wall Street, New York City, and certificates of deposit must be presented at the time of payment in order that the receipt of the depositary may be stamped thereon.

Wind and Flood Cause Great Wire and Utility Property Damage.

During the past week great damage has been done in many sections of the country by tornadoes, wind storms and floods to the electric light and power lines and stations, electric railways and the overhead telephone and telegraph systems.

On Thursday and Friday of the previous week great damage was done by wind and flood in several sections of Mississippi and Alabama. Early this week Omaha, Neb. and its environs and cities in Missouri and Kansas were devastated by a tornado, followed by fire. Wire service east and west of Chicago was crippled, in some instances to a greater degree than ever before in the history of the business.

On Tuesday floods throughout Indiana and Michigan resulted in great damage and loss of life. Dayton, O., suffered to the greatest extent, portions of the business and residence sections being ruined and the waterworks and lighting and power plants impaired. Hamilton, Delaware, Piqua and Columbus in the State of Ohio and Indianapolis, Peru and Marion in the State of Indiana, suffered great damage.

At the time of going to press there have come to light many incidents of heroic action upon the part of telephone and telegraph operators, linemen and engineers and electricians of the public-service companies. Reports concerning the extent of physical damage done will not be available until later on.

Several automatic and semi-automatic telephone exchanges are now being installed in France. If these prove as satisfactory as anticipated, it is intended to use the automatic system for all new exchanges in Paris.

End of Old Telephone Suit.

A final decree in the suit between the Western Union Telegraph Company and the American Telephone & Telegraph Company was handed down on March 18 by Judge Putnam in the United States Circuit Court of Appeals, at Boston, Mass. Unless appeal is taken to the Supreme Court, this will end the 20-year litigation which was caused by a disagreement regarding telephone rentals.

By the decree the telphone company will pay $3,141,529 to the Western Union Company and in addition turn over 18,000 shares of stock of subsidiary companies.

Minstrel Entertainment by Telephone Employees.

The Boston Plant Chapter of the Telephone and Telegraph Society, of New England, will present "The Minstrel Regatta" in Jordan Hall, Boston, Mass., on the evenings of Wednesday and Thursday, April 2 and 3.

This show is a musical review in three parts and includes a cast of 100, of which 50 are guaranteed to be the prettiest girls in the Bell System. It is stated to be the most pretentious amateur production ever seen in Boston.

Charles E. Ames is chairman of the Show Committee, and the ticket distribution is in charge of William J. Hadley, 10 Merrymount Road, Quincy, Mass.

Wireless Used in Longitude Determination.

A commission of four officers of the French army and navy is now in this country for the purpose of establishing the exact difference in longitude between the Eiffel Tower in Paris and the new wireless station of the United States Navy at Arlington, Va., by the exchange of wireless signals.

The exchange of signals has heretofore been possible only under the best weather conditions. The Arlington station has frequently received signals from Paris and on March 20 the station at the Eiffel Tower received some of the Arlington signals.

Meeting of St. Louis Jovians.

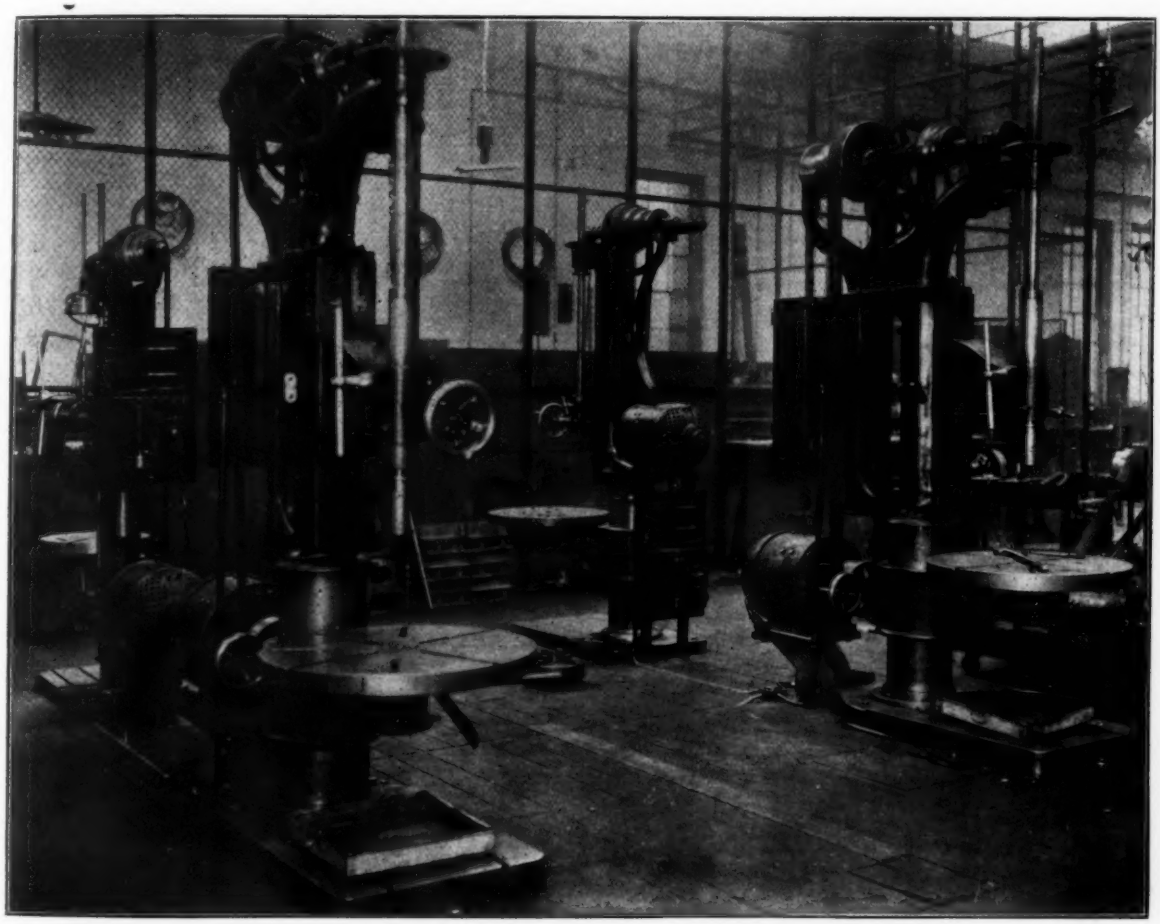
A meeting of the Jovian Chapter of the St. Louis League of Electrical Interests was held on March 18, with A. C. Einstein presiding. A paper was presented by F. B. Adam, vice-president and general manager of the Frank Adam Electric Company, entitled "Providing for Electric Service in the Home." This paper will be found in full upon other pages.

The architects of St. Louis were the invited guests of the League at this meeting. There were 25 of them present, the total attendance at the meeting being 102.

Electricity in Machine Shops.

While motors are being extensively used in machine shops and have given such universal satisfaction, still from the standpoint of the central-station company, there is a considerable field yet undeveloped. This article discusses some of the more important advantages and presents comparative costs on group and individual drive.

While, in the aggregate, the motor load in machine shops is perhaps greater than in any other one industry, still there is a considerable field yet undeveloped, in so far as a central-station power is concerned. Motor drive in machine shops has been so successfully applied, however, and the resultant benefits so widely appreciated that the following discussion will necessarily deal with only a few of the salient features to be considered in soliciting the adoption of electric drive for plants in this industry.



General View of Machine Shop With Individual Drive.

One of the most important phases influencing the successful conduct of any manufacturing establishment is the amount of output obtainable with a given personnel, tool equipment, floor space and working time. Without increasing any of these factors, the substitution of mechanical drive by the installation of electric motors has variously augmented the productive capacity of different shops from 5 to 100 per cent. In other words a greater amount of work is produced per operative machine per day, due to maintenance of speed under varying conditions of load; the ease by which the maximum cutting speed can be sustained throughout a given operation; the advantage gained by better arrangement of machines in regard to natural or artificial lighting facilities, as well as in the readier access to and sequence of material from the unfinished to the finished state. Finally, because the greater cleanliness, purer air and generally better hygienic surroundings of the motor-driven shop react favorably upon the health, cheerfulness and activity of the operatives.

The application of motors for driving machine tools in a manufacturing establishment may be divided into four classes: (1) Group drive at a constant speed. (2) Individual drive at a constant speed. (3) Individual drive at an adjustable speed. (4) Cranes, hoists, elevators, etc. The selection of the type of motor and the question of groups of individual drive depends upon the number of factors, viz., nature of the work, size or location of machine tool, percentage of time that machine is in operation.

In determining on the motor outfit for operating machine tools, one of the most difficult questions to decide is that of group or individual driving, and the most general solution is a combination of these two methods. The ideal method, and the one coming more and more into general use is to have the motor form an integral part of the machine. This method en-

tirely eliminates belting and shafting, both main line and jack shafts. The saving in cost of these mechanical transmission parts partially compensates for the installation of motor and controller.

The slip of belts introduces an uncertain factor in power supply which is entirely absent with individual motor Futhermore, with individual motor drive the power delivered to the driven machine is automatically controlled and, in case of heavy demands, may greatly exceed the rated power ot the motor, even for considerable periods of time. Thus a motor-driven machine is always capable of maximum production, while with belt drive and poorly adjusted belts the machine frequently balk before the full capacity of the machine is reached.

The even and easily manipulated speed control of machines individually driven increases their productive capacity to a very material extent.

The advantages of individual motor drive may be summed up as follows:

(1) Better control and greater range in speed and closer speed regulation. The average increment of speed increases in a belt driven machine tool is about 50 per oent. In an adjustable-speed motor it is 10 per cent to 20 per cent.

(2) Increased output and decreased cost of production, due in part to increase in amount of power available in motor over that transmitted by belts.

(3) Increased light and cleanliness by elimination of dust and belting.

(4) Greater economy in transmission, especially when tools are running only part of the time, as there is no loss due to driving belts and shafting when tool is idle.

(5) Reduced cost of repair and maintenance, owing to absence of shafts; hangers, pulleys and belts.

(6) Head room for cranes.

(7) More economical disposition of floor area and more convenient location of tools. Machines can be placed to best possible advantage with regard to light and sequence of operation. Additional tools can be readily added to equipment or location changed without any changes which are necessary in shafting when belt-driven tools are used.

(8) Use of portable tools which permits of bringing one or more tools to the work and thus performing several operations at the same time on a large casting.

(9) Reduced cost of buildings, as absence of shafting simplifies construction.

(10) Reduced cost in installation in many cases, especially for tools in isolated positions where expensive shafting and hangers would exceed cost of applying individual motors.

(11) Greater reliability and steadiness of power of freedom from stoppage of a number of tools, as in the case of a hot bearing or broken belt.

Speed Regulation.—The most important advantage to be gained is a speed regulation adapted to the work. The convenience of securing the desired speed for maximum cutting, when electric drive is used, will result in a material increase in output. On most of the belt-driven machine tools the average increase of speed per step is about 50 per cent. For instance, the spindle speeds might run as follows: 10, 15, 23, 53, 70, etc. It was found by closely watching the work on these machines that while in many cases the speed was evidently too low for a given piece of work, yet the increase of speed to the next step was so great that the tool steel could not stand it. The controller used is such that the average increase of speed per step is about 10 per cent, i. e., 10, 11, 12.1, 13.3, 14.6, 16.1, etc. It will therefore be seen that the output per machine and therefore per man, will be considerably increased, since it is possible to more nearly approach the working limit of the tool steel. In every shop the labor item is the largest single item of expense, and the saving of a small per cent of a man's time will amount to quite an item at the end of a year.

It provides a steady power and permits of great ease of speed regulation. The controller can be placed at the most convenient point, or, if advisable, two or more handles can be provided at different points, one being arranged to travel with the tool carriage. With the belt-driven machine more or less time is always lost in throwing a belt, and a negligent operator will not always take advantage of a change of speed on account of the exertion required to make the change.

It allows head room for cranes. A traveling crane can be used to great advantage in a machine shop, particularly for serving the larger machines. The effect of the electric crane on the economy of the shop cannot well be over estimated; though it is difficult to express in figures this economy.

Increased Light and Cleanliness.—With plenty of light and the absence of dust and dirt caused by shafting and belts, a workman surely ought to be, and usually is, inspired to do better and more efficient work.

Flexibility.—The machines can be placed to the best possible advantage and, if it should be necessary to rearrange them, it can be readily done.

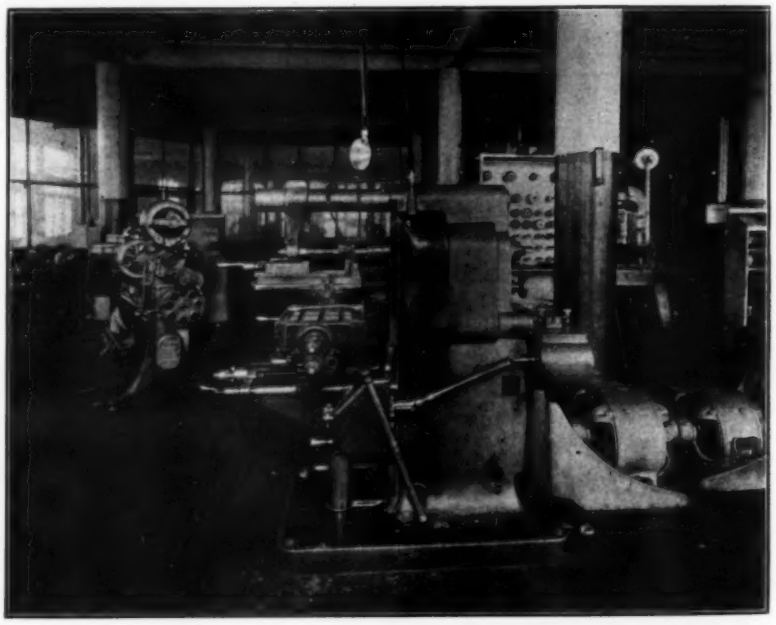
If it is necessary to work a few machines overtime, a lot of power will not be wasted in running a shop full of shafting.

When a machine is not running it is not using power, whereas, in a belt-driven shop, the shafting is always running. Experiments have demonstrated that in an ordinary machine shop the shafting requires as much or more power than the power required to run the machines.

The absence of shafting simplifies the construction of the building.

Spindle Speeds.—A plate may be placed

(*Continued on page 643.*)



Examples of Individual Drive—Milling Machine in Foreground.

Machine Shop Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use of 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Jobbing machine shop doing a general line of machine-shop work. The plant operates 10 hours per day.

Total connected horsepower, 25. Total number of motors installed, 3. Average kilowatt-hours per month, 2,391.

Kilowatt-hour consumption for 12 months: February, 2,040; March, 2,230; April, 2,270; May, 2,100; June, 2,280; July, 2,410; August 2,600; September, 2,750; October, 2,530; November, 2,290; December, 2,460; January, 2,730.

Load-factor, 18 per cent; operating-time load-factor, 36 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts. Motors are all of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	7.5	1,120	Belted to a line shaft (40 feet long) driving one double six-inch grinder; one Lodge & Shipley 24-inch engine lathe; one Jones & Lamson 16-inch turret lathe; three 16-inch engine lathes; one 12-inch engine lathe; and one tapping machine.
1	7.5	1,200	Belted to a line shaft (30 feet long) driving one 16-inch by 2-inch grindstone; one Reynolds hobbing machine; one Kempsmith No. 8 miller; two No. 6 millers; one Cincinnati milling cutter grinder; two six-inch pattern lathes; and one 30-inch band saw.
1	10	1,120	Belted to 90-foot shaft driving one Barnes 9-inch drill; two Barnes 20-inch drills; one hack saw; one three-foot radial drill; two Pond 24 by 24-inch planers; one Rockford 16-inch shaper; five 16-inch lathes; one double 12-inch grinder; one double 8-inch grinder; one 12-inch cold saw; and one 24-inch emery wheel.

Small machine shop in Chicago operating 9 hours per day.

Total connected horsepower, 17. Total number of motors installed, 5. Average kilowatt-hours per month, 740.

Kilowatt-hour consumption for 5 months: October, 663; November, 916; December, 791; January, 668; February, 655.

Load-factor, 8 per cent; operating-time load-factor, 18 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	3	1,800	Belted to 36-inch Buffalo blower.
1	2	1,200	Belted direct to one Cincinnati drill press.
1	2	1,800	Belted direct to one 24-inch Cincinnati shaper.
1	5	1,800	Belted to one 10-inch Jarecki pipe cutter.
1	5	1,800	Belted to shafting driving one 10-inch double emery wheel; and one 26 by 16 Bridgeford engine lathe.

Small machine shop, employing nine men, working 10 hours per day.

Total connected horsepower, 10.5. Two squirrel-cage induction motors installed. Average kilowatt-hours per month, 206.

Kilowatt-hour consumption for 8 months: March, 26; April, 362; May, 300; June, 184; July, 131; August, 177; September, 233; October, 235.

Load-factor, 4 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	3	1,800	Belted to line shafting driving 41 by 21-inch New Haven engine lathe; one 14 by 8-inch Sebastian engine lathe; one 14 by 10-inch Carroll engine lathe; one No. 16 Doty punch and shear; one Davis 20-inch drill press; one Baker 18-inch shaper; and one 8-inch Champion blower.
1	7.5	1,200	Belted direct to one No. 4 Buffalo blower, speed 3,000 revolutions per minute.

Machine Shop Data—Sheet No. 2

Jobbing machine shop, employing 10 men and operating 10 hours per day.
Total connected horsepower, 17.5. Total number of motors installed, 2. Average kilowatt-hours per month, 747.

Kilowatt-hour consumption for 12 months: January, 726; February, 689; March, 590; April, 671; May, 885; June, 919; July, 736; August, 701; September, 705; October, 779; November, 810; December, 760.
Load-factor, 8 per cent; operating-time load-factor, 16 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. Motors are of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M	Application.
1	7.5	1,120	Belted to a line shaft driving one Garvin No. 12 automatic bolt cutter; one Davis No. 2 keyway slotter; one Brown & Sharpe surface grinder; one carborundum wheel, 8 by 1.5 inches; one Barnes 22-inch drill; one 14-inch punch press; one hack saw; and one Cincinnati 30-inch planer.
1	10	1,200	Belted to a line shaft driving one Wells double tool grinder; one Hendey 30-inch engine lathe; one Diamond No. 1 emery wheel; one Hendey 20-inch engine lathe; five Hendey 16-inch engine lathes; one Hendey 15-inch engine lathe; three Hendey 14-inch engine lathes; one double emery wheel (16 by 2 and 12 by 1 inch); one grindstone, 14 by 4.5 inches; one Hendey 20-inch shaper; one Hendey 18-inch shaper; one Garvin No. 3 plain miller, two Garvin eight-inch lathes; one Garvin cold saw; one Garvin 14-inch drill; one Garvin 12-inch drill; one Garvin two-spindle 14-inch drill; four Brown & Sharpe milling machines; one Brown & Sharpe eight-inch lathe; one two-foot tumbling barrel; one Barnes 24-inch drill; and one Universal No. 1 miller.

Small jobbing machine shop employing 15 men and working 10 hours per day.
Total connected horsepower, 15.5. Total number of motors installed, 4. Average kilowatt-hours per month, 1,090.

Kilowatt-hour consumption for 12 months: April, 1,059; May, 815; June, 597; July, 1,135; August, 1,027; September, 1,391; October, 1,395; November, 920; December, 1,351; January, 1,207; February, 1,275; March, 1,019.
Load-factor, 12 per cent; operating-time load-factor, 25 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. Motors are squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	7.5	1,120	Belted to a line shaft driving one Washburn double emery wheel; one 16-inch lathe; one five-inch boring mill; one 24-inch planer; one 36-inch planer; one keyseater; two hack saws; one 36-inch engine lathe; one four-inch pipe machine; one Cincinnati 34-inch by 24-inch milling machine; and one Cincinnati No. 1.5 shaper.
1	5	1,200	Belted to a line shaft driving one 1.5-inch drill press; one 2.5-inch drill press; one bolt drill; one speed lathe; one grinder; one hack saw; and two emery wheels.
1	3	1,120	Belted direct to a Jones & Lamson 28-inch turret lathe.

Machine shop located in Mankato, Minn., doing general repair and machine work. Operates 10 hours per day.
Total connected horsepower, 25. Total number of motors installed, 3. Average kilowatt-hours per month, 1,686.

Kilowatt-hour consumption for 12 months: January, 1,640; February, 1,850; March, 2,110; April, 2,000; May, 1,430; June, 1,760; July, 1,380; August, 1,770; September, 1,550; October, 1,800; November, 1,420; December, 1,320.
Load-factor, 12 per cent; operating-time load-factor, 25 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. All motors are of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,200	Belted to a line shaft driving one 14-foot iron lathe, 32-inch swing; one 14-foot iron lathe, 30-inch swing; one six-foot iron lathe, 16-inch swing; one 42-inch iron lathe, 14-inch swing; two 24 by 24 by 60-inch iron planers; one 16-inch shaper; one 32-inch vertical drill press; one 28-inch vertical drill press; one 14-inch emery wheel; one eight-inch key-seating machine; one power punch; one 50-pound trip hammer; and one 14-inch hack saw.
1	10	1,800	Belted to a line shaft driving one 28-inch blower; one 30-inch iron mill roller grinder; and one iron corrugating machine.
1	5	1,800	Belted to a line shaft driving one 36-inch band saw; one 12-inch circular saw; one 16-inch wood lathe; and one saw gummer.

on each machine to show the different spindle speeds for each position of the controller handle with each run of gears, if there is more than one run, which will greatly assist a machine operator in determining the point at which to operate his controller.

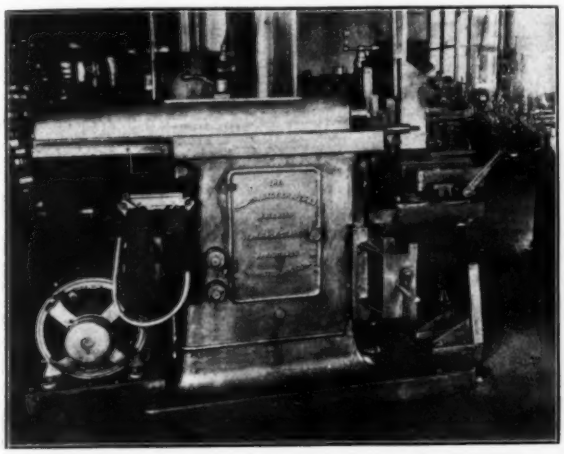
Size of Motor.—In general the motor shunt-wound motors may be used; while machines having a reciprocating motion, either of work or tool, such as planers, slotters, shapers, etc., should invariably be equipped with compound-wound motors.

Machines having flywheels and in which work is done intermittently, as in punch presses, squaring shears, etc., should also have compound-wound motors.

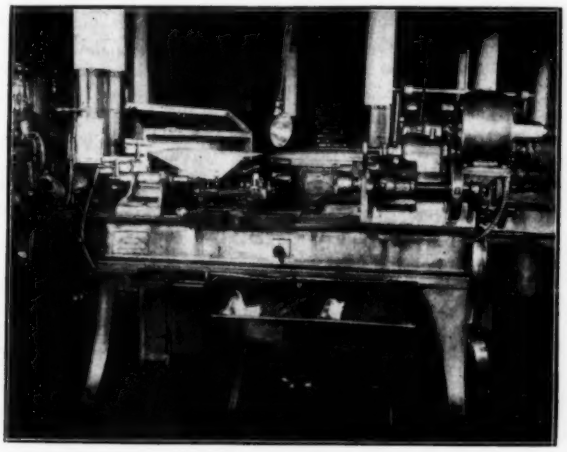
Cranes, hoisting machines and large bending rolls are best driven by series-wound motors. Small bending rolls, however, may be operated by compound wound machines. Where bending rolls are operated by a series motor the first notch of the controller should have a suitable resistance to prevent the motor from running away when the load is removed from the rolls and it is desired to keep the motor in operation.

Motor Sizes.

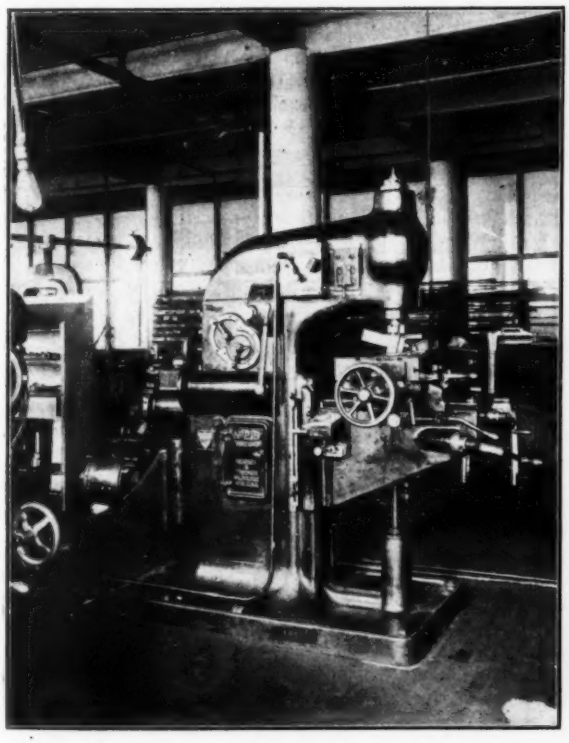
The accompanying tables contain the sizes and speeds of motors usually employed with the average duty indicated for machine tools. The constant-speed motors are selected with a view to utilizing speeds as near as possible to those obtainable with 60-cycle induction motors. By this means the same gear ratios can be employed with either direct-current motors or 60-cycle induction motors.



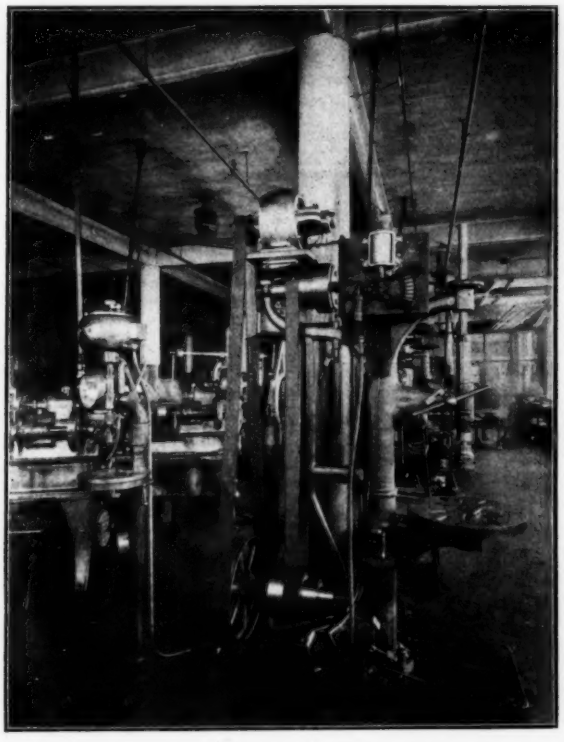
Back-Geared Motor Driving Shaper.



Three-Horsepower Motor Direct-Connected to Lathe.



Motor Direct-Connected to Vertical Milling Machine.



Three-Horsepower Motor Belted to Barnes Drill Press.

to be applied to a particular machine should not be determined by the average power required, but should be capable of caring for the minimum load required under severe conditions.

Motor Windings.—For machine tools having a rotary motion, such as lathes, milling machines, boring mills, drills, etc.,

Conditions When Equipping Old Machines With Motor Drive.

When changing over from lineshaft drive to individual motor drive the question arises whether to equip the old lineshaft driven machines with motors or to install new motor-driven machine tools. The old machines are not as strong in construction as new tools designed for motor drive, nor are they equipped with the latest devices by means of which the time required to make adjustments can be greatly reduced. Owing to weaker construction old machines cannot be made to remove metal as rapidly as machines built with this point in view. The old machines are also more or less worn and not as accurate as new machines. A concrete example will show a method of arriving at a decision between attaching a motor to an old machine and purchasing a complete new motor-driven equipment.

The case taken for consideration involves the modification or exchange of a 72-in. vertical belt-driven boring mill, so as to obtain a greater output at lower cost per unit of product. This mill, the original cost of which was $3,200, has been in use five years. The hourly overhead operating charge has been determined at 91 cents. The machinist receives 35 cents an hour for 54 hours per week (2,808 hours per year). The total earnings for the year from this machine amount to $4,200. The operating expenses for the year are as follows:

Overhead	$0.91 \times 2808 =$	$2555.28
Wages	$0.35 \times 2808 =$	982.80
Total		$3538.08
Net profit $4200 — $3538 =		$662.10

The depreciated value of this tool on a basis of 10 per cent reduced balance is 66 per cent of its first cost. If a motor is installed the investment appears as follows:

Value of tool $0.66 \times 3200	=	$2112.00
Cost of motor, gears, controller, wiring, etc.	=	550.00
Total investment		$2662.00

The hourly overhead charge of 91 cents includes interest and depreciation at 16 cent an hour; the overhead charge exclusive of interest and depreciation will therefore be 75 cents an hour. The depreciation on the new investment for the remaining five years' life of the tool will be 20 per cent per year, making the charge for interest and depreciation 26 per cent. The operating cost of the old tool with motor drive is, therefore,

Overhead (exclusive of interest and depreciation) $0.75 \times 2808	=	$2106.00
Interest and depreciation, 26% of $2662	=	692.12
Wages, $0.35 \times 2808	=	982.80
		$3780.92

Assuming 10 per cent increased earnings, due to adoption of individual motor drive, makes the total earnings:

$4200 + $420 = $4620.00

The net profit is then

$4620 — $3780.92 = 839.08

or 31.5 per cent interest on the investment of $2662.

The corresponding figures, based on the installation of a new machine tool with individual motor drive, are approximately as follows:

Cost of new tool	=	$3400.00
Cost of motor, etc.	=	270.00
		$3670.00
Scrap value of old tool at 5%		160.00
Investment		$3510.00
Overhead operating charge: $0.75 \times 2808 =		$2106.00
Wages as above		982.80
Interest and depreciation for 10 years (depreciation 10 per cent, interest 6 per cent) 16% \times $3510 =		561.60
Total		$3650.40

Assuming 25 per cent increased output for the year, the total earnings become:

125 per cent \times $4200 = $5250.00

Net profit is then $5250 — $3650.40 = $1599.60

or 45.3 per cent on the investment.

The above figures show that for the conditions given, approximately 14 per cent greater return on the investment is gained by installation of a complete new tool. It is evident, therefore, that although a somewhat greater capital is required for the new installation, it is by far the better investment. It is also probable that the old machine tools would not last more than five years after the changes were made, whereas the new tool will give good service for at least double that period. Furthermore, the new machine has the added advantage of being in first class condition, thus insuring greater accuracy of workmanship and less liability to accidental delays.

Commercial Practice
Management, Rates, New Business

Running a Public-Service Corporation.

In few lines of industry is there a more insistent demand for large amounts of additional capital than that which comes from the electric light and power, gas, and street railway companies, says W. H. Hodge, publicity manager of H. M. Byllesby & Company, in a recent issue of *Harper's Weekly*. Thirty years old, the electric light and power business in this country represents not less than two billion dollars, or more than twice the money sunk in the century-old gas industry, while the capital account of electric railways—younger still than electric lighting—is considerably more than the two first mentioned combined.

Great as the physical property is that lies behind the bonds and stock held very widely by the investing public, the work of development and construction is by no means finished, although the period of experimentation is closed. So rapid is the normal growth of the business of these corporations that the urgent necessity for physical expansion continues in increasing measure, and the financial markets are constantly called upon to supply the cash. There is at present a tendency to look to Europe for part of the heavy annual financing. It is not a difficult task to interest capital on the other side of the Atlantic in industries which have shown the commercial hardihood of American utilities in times of stringency and depression.

The cause of many an investor's hesitation before placing his money in utility corporations is what he reads in the newspapers regarding public ownership, agitations to lower the rates charged for service, contests over franchises and municipal contracts, and threatened or actual competition from public or private plants. He fears that where there is so much smoke there must be some fire, and sometimes, without investigating further, he decides not to risk the presumable burning of his money in this particular way.

As a matter of fact the financial hazards which he conjures are more possible than probable, provided his money is invested in a company that has the benefit of what may be styled "progressive management." Even in a non-progressive company the money represented in senior securities is reasonably sure of safety.

Up to recently the average citizen heard a great deal more about the benefits of municipal ownership than he did regarding the efficacy of regulation by commissions or the progressive management of utility corporations. The politicians dazzled him with tales of public-ownership achievements, principally abroad, where individual profits long ago produced a leisure class content to direct its ability toward the efficient conduct of community affairs. Too often sharp differences in conditions, costs, and wages, and marked dissimilarities in the character, value, and

extent of the service were ignored. There is not much use in comparing nations in which the entire tendency is for cheapness with a people whose demand is for the best.

Yet after all the talk and political campaigning centering on municipal ownership, there is in reality comparatively little of it in the United States. The municipally owned and operated street railways in the United States number one or two; the city-owned gas plants about two dozen, and in the electrical industry the municipal plants do less than 10 per cent of the total business, although hundreds of small communities have had to install their own plants because private capital could not be interested.

Most of the principles of action of progressive utility management are simply time-honored platitudes put into use. It is being recognized that the executive positions in utility operation call for types of ability of a very special order. The men who can fill these places successfully must cherish and practice the finest of commercial ideals. They must be not only acute business men and good managers of other men, but blessed with broad sympathies and endowed with the spirit of true co-operation—namely the desire to give as well as take. These managers and sub-managers have as their cardinal task the popularization of their companies, and it is clear that their faith in human nature must be deep and the enthusiasm for their work boundless.

It is necessary that progressive utility management proceed from the basis that its franchises are in the nature of public trusts, to be administered quite as much in the interest of the public, which confers them, as the stockholders who supply the capital. Profits must be moderate; service good; service rendered to the greatest possible number of people; rates as low as possible. The company, being one of the beneficiaries of municipal growth, must do its part in all movements for the public good. It must treat its customers as valued patrons, not as necessary evils.

The regulation of utilities by state commissions has spread over the United States very rapidly, and apparently is working to the best interests of all concerned—the public, the investor, and the companies. Provided these commissions proceed justly and wisely, the policy of regulation will become permanent and represent a fixed solution of public-utility problems.

The corporation least of all should desire favoritism or undue leniency, since such administration would disgust the people, and the public's conclusion would be that justice can be obtained only through municipal ownership and direct competition. It would not appear, however, that such a contingency exists or is prospective. Clean, even-handed justice is all that either side should obtain. In Massachusetts, Wisconsin, New York, and other states, the decisions of the state commissions have been upright and sensible, and the precedents set by these three great pioneers in public utility regulation will have extraordinary value for many years.

Most of the franchises granted by cities to utility companies are limited, and will in due course expire. The renewal of these franchises will be influenced by the previous administration of the property and also by the regulatory commissions. The indeterminate franchise idea, as adopted in Wisconsin—namely, franchises terminable by the commission for cause—has certain elements of strength which may cause it to be widely followed. Although a company operating under an indeterminate franchise has no fixed tenure of its right to occupy and use the highways, it must be remembered that the so-called perpetual franchises in themselves have sometimes produced much damage to corporations. Whenever a fixed or unlimited term franchise becomes onerous to the public, ways can be found by that community to seriously injure, if not ruin, the company. It is not necessary to annul the franchise.

The security of any corporate investment, after all, lies in the character of the management of the corporation, and it appears to many that indeterminate rights are well calculated to spur the management to efficiency and sensible conduct. The weakest link, of course, lies in the necessity for an absolutely fair and able commission or court to decide when and why a company should be deprived of its franchise. We must, however, assume that there will be fair and honest courts in the future, unless we are prepared to admit national dissolution.

During the last few years the relations between utility corporations and the public have been studied as never before. This study and its resultant production of "experts" has swept away many of the wildest and most fantastical notions regarding both alleged evils and nostrums prescribed therefor. A public-utility operator today would much prefer leaving his case with an expert committed professionally against him, than to a shyster or crank who would not or could not give genuine study to the issues and their underlying circumstances. Therefore, in framing new franchises, it is fair to assume that there will be more knowledge and reasonableness by the representatives of the public and greater tact, ability, and liberality on the part of the corporations.

Syndicate management has given many small cities and towns metropolitan service. It has given day and night service to many villages previously without service at all, and is rapidly reaching out to the farmers wherever possible.

COST OF POWER PRODUCTION IN A REPRESENTATIVE CENTRAL STATION.

By E. Freeman.

Figures taken from the operating records of an electric light company, serving a city of about 110,000 people for the year ending June 30, 1912, show that the net cost of manufacture per kilowatt-hour was 0.85 cent, which is a reduction of 3.4 per cent compared with that of the previous year. The cost of manufacture does not include distribution, office expense and management, taxes and miscellaneous expense.

The plant is a representative steam-generating station and has a rating of 5,325 kilowatts. The boiler equipment consists of eight Babcock & Wilcox water-tube boilers rated at 400 horsepower each fitted with Taylor stokers. There are four vertical cross-compound McIntosh & Seymour engines direct-connected to General Electric machines of the following capacities: two 600, one 1,500, and one 2,000 kilowatts, and also a General Electric exhaust-steam turbine driving a 625-kilowatt machine. The service consists of 2,300-volt alternating-current supply and 500-volt direct current.

About 51 per cent of the company's output is taken by a motor load, a gain of nearly six per cent compared to the business of the former year. During the year the company generated 11,922,704 kilowatt-hours and sold 8,751,938 units. The power sales amounted to 6,132,177 kilowatt-hours. The fuel consumption was 15,154 tons of bituminous coal, with an average cost of $4.06 per ton, making the fuel expense per unit generated 0.52 cent, which is 0.01 cent less than that in the previous year. The labor cost per kilowatt-hour was 0.16 cent against 0.19 cent the year before. The total labor cost of $19,831.32 was distributed among one chief engineer, four assistant engineers, seven firemen, three oilers, one engine wiper, four coal passers and four switchboard operators. The coal consumption per kilowatt-hour delivered at the station switchboard was 2.84 pounds, equalling the amount burned the previous year.

The tabulated data are as follows:

COST OF MANUFACTURE FOR THE FISCAL YEAR.

Kilowatt-hours generated at the switchboard	11,922,704
Kilowatt-hours sold	8,751,938
Kilowatt-hours power sales	6,132,177
Coal burned, tons	15,154
Average cost of coal per ton	$4.06
Fuel cost (per kilowatt-hour at 0.52 cent)	$ 61,531.21
Oil and waste	1,454.21
Water	3,637.76
Station wages (per kilowatt-hour at 0.16 cent)	19,831.32
Station building repairs	1,866.58
Steam equipment repairs	6,650.80
Electrical equipment repairs	5,465.35
Station tools and appliances	766.60
Total	$101,203.83

EPISODES IN CENTRAL-STATION MANAGEMENT.

By J. R. Thomas.

Why the Lights Went Out.

Among the consumers of an electric light company there are kickers and kickers. There are some who never kick unless they have a cause. There are others who kick who never have a cause. They must both be listened to and treated with the same consideration and courtesy and it is often that employees fail to realize the influence this has upon the opinion the general public holds concerning the lighting company. Fortunately, however, most lighting companies are coming to realize that all kickers —chronic or otherwise—should receive kind and courteous treatment and that they should endeavor to make of them boosters instead of knockers.

An incident illustrating this point occurred some time ago. A consumer came into the office and reported that his lights had gone out the night before. Accordingly during the day our trouble-man was sent to the flat in question to remedy the trouble but found the lights burning all right. About eight o'clock the next morning the same consumer came in again, very angry because his lights had not been fixed. I called the trouble-man and asked him in the presence of the consumer why he had not attended to the trouble, to which he replied that he had gone to the flat and found everything working nicely. The consumer said the lights burned all right until about 10 p. m., when they went out as they had done for several nights. I assured him we would look after the trouble immediately and sent two men to make a thorough investigation. On arriving at the flat they again found the consumer had light and everything was apparently in good working order. They inquired of the other occupants of the building and found that none of their lights had gone out and after making an examination of all fuses and connections, meter, etc., to see that all joints and connections were tight and in proper condition, they came back and reported that the man was crazy. They could find nothing wrong and the other occupants of the building were positive that the lights had not gone out.

The following morning the consumer again came to the office purple with rage, saying that he wanted to pay up to date and have the d—— electric lights cut off. He did not propose to pay for something and then not be able to use it when he wanted to. Every night when they were about ready to retire the lights would go out, leaving them to grope about in the dark, bumping their corns on chair rockers, etc.

It was some time before he would allow us to get in a word. Finally, after he had run down to some extent, I was able to assure him that I would attend to the matter personally and see that the trouble was remedied if we had to re-wire the building.

The trouble-man and I went to the flat. We went over all connections, fuses, etc., which he had gone over twice before and found everything in good condition and the lights burning. After making a thorough investigation of everything on that floor I went to the attic, leaving the lamps turned on and the trouble-man to watch and signal me if they should go out while I was going over the wiring in the attic. After tracing each circuit and switch wire, I finally came to a pair of wires which went down inside a partition. These two wires seemed to be for a single-pole switch on the bed-room and living room. As I did not remember having seen a switch on these while in either room, I called to the trouble-man to see what it was and where the wires went. He called back that there were no wires coming out of the wall on either side. In order to satisfy my curiosity, I went down stairs to investigate for myself and found as he had said that there were no wires to be seen on either side of the wall. There was, however, a small closet in one corner of the bed-room and I decided the wires must come out in this closet. I opened the door and saw the wall covered with clothes hanging on hooks. After I had removed about half of the clothing from the wall and had just taken hold of a couple of night-gowns to remove them from the hook the man called to me that the lights were out, and as I took the gowns from what I thought was a hook I saw they had been hung on two wires which had been loosely twisted together so that when the weight was removed they sprung apart just enough to break the circuit. Every night when they began to prepare for bed and took their gowns off the hook the lights would go out and the next morning when they replaced them it would turn the light on again. An old ampere-hour meter had been connected to these wires several years before and when other rooms had been rented together with these, the meter for the entire flat was placed in a different location. These two wires had probably not been seen by any of our men for years.

When the consumer realized what had caused all the trouble he saw the humorous side of what only a short time before he had threatened to make a tragedy, and has ever since been a good friend of the company.

An Automatic Fire Extinguisher.

Several years ago when we were operating our old electric light plant, which was antiquated and about worn out, it was often necessary to shut down on Sundays for a few hours to make repairs on the steam end of the plant which could not be made while the plant was in operation.

This almost weekly shut-down was the cause of a number of fires, due to consumers attempting to use their electric irons when the current was off. They would connect up the iron and find it would not heat and abandon their pressing, thoughtlessly leaving the current turned on the iron. About three or four o'clock in the afternoon the plant was started up and the current turned on to the lines. These irons which were left connected would begin to heat up and unless someone would discover it and turn off the current the iron might continue to heat until it set fire to something. This happened in a number of cases, the most interesting of which was at a hotel.

One Sunday evening about dark a man passing along the street noticed a mass of flames in one of the rooms on the fourth floor. He ran to the Fire Department, which was just across the street from the hotel, and gave the alarm. The firemen ran to the hotel with their chemical extinguisher and rushed upstairs, causing a panic among the guests and employees, who were not aware of the fire in the building. Reaching the room where the fire had been discovered they threw open the door and found the room filled with smoke, but no flames to be seen.

An iron had been left sitting on an ironing board and the current left turned on. The iron had become overheated, setting fire to the ironing board, which burned until the legs collapsed. The iron rolled under a near-by sink, where it came in contact with a lead water pipe, melting a hole in it, through which the water squirted out, spraying the conflagration and extinguishing the flames.

New Office Building for Baltimore Company.

The Consolidated Gas, Electric Light & Power Company, of Baltimore, Md., has leased for a term of years the six-story building at Lexington and Park Avenues. This building is in the immediate business section of the city and among the largest department stores. It will be remodeled and fitted for the use of the company's electric business offices.

Free Lighting for Weather Records.

The Nashville Railway & Light Company, of Nashville, Tenn., has offered to illuminate the new kiosk of the Weather Bureau, which has been constructed outside the Custom House in that city. It contains instruments giving the usual records of weather conditions. The proposed lighting will make these visible at night as well as by day.

Electrical Construction

The Wiring for An Interesting Installation of Indirect Lighting.

The illumination and wiring of the building now the new home of a number of the larger of the wild animals in the zoölogical collection of Lincoln Park, Chicago, was a problem by no means easy. The solution arrived at is most interesting, and the methods employed in the installation of the lamps and the circuits for them can be studied with profit by the electrician.

The building is rectangular in form, and, of course, is but one story high. Along the wall on one side of the building, there is a row of cages, as is shown in Fig. 1. Between the cages and the opposite wall is what is known as the public space, and the dimensions of this are 180 by 40 feet.

It was desired to provide a uniform illumination of about two foot-candles over the floor of the public space without having any of the lamps or fixtures visible at all from the floor of the room. In order to accomplish this the lamps were all placed in coves, or troughs, in the walls provided for the purpose, these coves being formed by the shelf-like projections seen in Fig. 1, one of which extends along each wall just under the top row of windows. Edison Mazda lamps, of the tubular type, with candelabra bases, are employed. These lamps, which are of the 25-watt size, are spaced 10 inches apart.

Fig. 1.—Interior of Room, Showing Coves in Which Lamps Are Installed.

Fig. 2 is a cross-section of one of the troughs, and shows very clearly how the reflectors are made. The bottom of the reflector is formed of steel plate with its inner surface white enameled, while in the walls of the trough ripple-surface mirrors form the reflecting body. From the bottom of the trough, and from one of the walls, as well, the light is thrown directly on the ceiling. Light incident upon the other wall reaches the ceiling after a second reflection, from the wall opposite.

The ceiling averages about 25 feet in height, and, being made of glazed bricks, is a fairly good reflecting surface. Illuminometer tests show the average illumination to be 1.85 foot-candles throughout the public space.

Remembering that in Fig. 2 he is looking along one of the troughs and that in Fig. 3 he is looking down from above on a fixture from which one of the lamps has been removed, the reader can easily get a good idea of how the lamps are supported and the circuit connections made. It is understood, of course, that the lamps are placed with their filaments parallel with the bottom of the trough.

A thin piece of steel has a 1 1/16-inch hole bored in each end of it, and is bent *U*-shaped, with the sides of the *U* three inches apart, as shown in Fig. 3. Being bolted to the metal of the trough in a manner made clear in Figs. 2 and 3, this piece of steel forms the support for two lamp sockets. No. 312 Federal sockets are employed. This is a porcelain socket, the end of which away from the lamp can be slipped through the hole in the supporting fixture just described far enough to bring a shoulder on the socket against one side of the fixture, or clip, as it is called in Fig. 3. The opposite end of the socket being threaded, or provided with a spiral ridge of porcelain like threads, the socket is secured in place

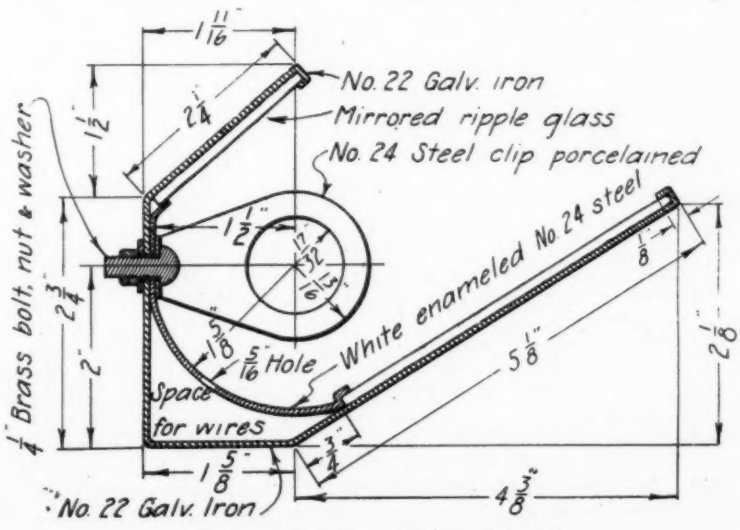


Fig. 2.—Cross-Section of Trough Reflector.

by means of a thin metal bushing, or locknut, which is screwed on it.

Underneath each reflector trough or cone, along the whole length of the trough, there is space for the lamp circuits. These circuits are run in conduits provided with outlet fittings of the condulet type for bringing the wires out to the lamps, where they are connected as shown in Fig. 3. Loricated conduit and Safety Ruby Core wire are used throughout the installation. The conductors are brought into the trough through 5/16-inch holes in the bottom of it, the position of one of which is indicated in Fig. 2.

The animal cages in the building are all likewise provided with completely concealed indirect lighting equipment, similar to that just described.

Although lighting current is supplied here at an exceedingly low rate, it was the aim of E. C. Rutz, electrical engineer for the park commissioners, who designed the installation and had charge of putting it in, not to allow the light to be needlessly wasted. It will be noted that, in line with this intention, all metal surfaces within the troughs are enameled. Moreover, the lamp circuits are split up so that when full illumination is not needed enough lamps can be turned off to reduce the intensity to about one foot-candle without greatly affecting the uniformity of light distribution.

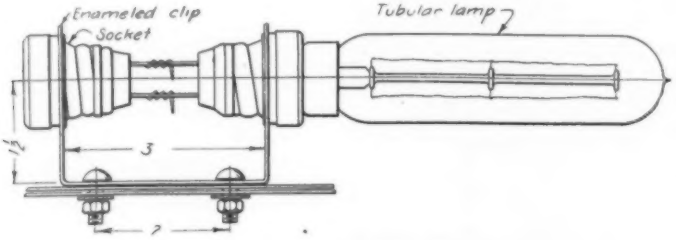


Fig. 3.—Fixture With One Lamp Removed.

Annual Banquet of Louisville Contractors.

A wealth of oratory was mingled with an abundance of good food and drink at the annual banquet of the Louisville Electrical Contractors' Association, of Louisville, Ky., held at the Galt House on March 17.

Christopher C. Childers, of Childers & Waters, presided as toastmaster at the affair, and introduced in an entirely original fashion every man who sought the floor. H. G. Wooten, the electrical inspector of the Kentucky Acturial Bureau, was the first speaker. Mr. Wooten's subject was "The Relation of the Electrical Inspector to the Contractor." Outlining the work of the Kentucky Acturial Bureau in the especial application whereby it encourages the highest possible class of electrical installations, Mr. Wooten succeeded in convincing his audience that the inspector and the progressive contractor work largely toward the same end.

"Raising the Standards of Electrical Contracting," was the subject handled by Frank E. Good, of Fred A. Clegg & Company, president of the Louisville Association. "What contractors need nowadays, in view of the universally established demand for their services, is better prices, remuneration which will enable each job to show a distinct margin of profit," said Mr. Good. "In the past there have been a few evident reasons why the contractor occasionally worked at a disadvantage. Every member of the trade knows that he has lost money, or has come dangerously near losing it, because of one of these reasons. The first is inability to estimate correctly because of unfamiliarity with the data of similar jobs preceding. This may be overcome by a careful record of your experience, and close study of this record. Another pitfall threatening the contractor is failure to include all of the items specified in the work in hand. Such mistakes are traceable to either carelessness or ignorance of the subject, and in the present day of modern methods among contractors this particular weakness is rapidly becoming extinct. The worst evil is the practice of figuring good work at cost, or practically at cost—'to get the business.' The trade should realize constantly that it is not the quantity, but the quality of business which counts."

Edward Thirlwell, of the Marine Electric Company, spoke upon "The Advance of Metal Construction." Mr. Thirlwell's remarks were highly interesting, quoting statistics to show the increased usage of conduit wiring and flexible metal joints and pointing out that the specifications of the architects cannot be watched too closely. Especial emphasis upon specifications stipulating the number of conductors to be pulled through a conduit of any given dimension was placed by Mr. Thirlwell.

By way of closing the evening with a rousing speech striking a popular chord, Jesse M. Vollmer, secretary of the Builders' Exchange, illuminated the subject of "Organization" for contractors.

PROVIDING FOR ELECTRIC SERVICE IN THE HOME.[1]

By F. B. Adam.[2]

It seems to me just a few years ago that we used to get the answer from architects and owners that electricity in the home was a luxury, and therefore to be considered: (1) an expense; and (2) unnecessary in the home of the average citizen.

Today, with the low rate of electricity to residences, I believe that every person who has used electricity and investigated the improvements, will have to acknowledge that it is an absolute necessity to the well equipped home, whether it be for the poor man or the rich man, who can afford or rent a home. And when the people actually engaged in the electrical business are obliged to acknowledge that even they have not been able to keep up with all the new ideas for lighting, heating, cooking and power developed for the comfort and convenience of the home in the past few years, it does not seem strange that the architect and the man about to build a home should overlook an important item in the equipment of this home, during its construction, by neglecting to provide for these conveniences.

I have divided this paper into several sections, and will begin with the one I think is of first importance in the eyes of the architect and owner, viz. the cost.

Cost.

I think it will be a surprise to all of you to know that the electrical equipment of the average home amounts to only 1.5 per cent of the total cost of the building, not including the cost of the ground or the furnishing of the building. I will further say that on those houses where the owner comes to an architect with $8,000 and wants a $10,000 house put up, the architect can even get the cost down as low as 1.25 per cent, always of course at the sacrifice of comfort and convenience to the owner, and a profitable and satisfactory customer to the electrical industry.

Now, the particular point that I should like to make with you is the fact that in my experience, just as soon as the architect calls in a practical man to consult regarding the requirements of the building, the cost of the electric work goes up; and whenever the architect is liberal enough to call in the contractor to consult with the owner it increases the cost still more. I should say that from an average of 1.5 per cent, the consultation between the engineer or contractor and the architect would increase the cost about 40 per cent. When the engineer or contractor comes in direct touch with

1 Paper presented at meeting of Jovian Chapter, St. Louis League of Electrical Interests on March 18.

2 Vice-president and general manager, Frank Adam Electric Company.

the owner and shows him all the advantages of equipping his home for "everything electrical" while in the course of construction, the percentage of cost is increased from 1.5 to 3 and even 4 per cent, say an average increase of 100 per cent over what under ordinary conditions should be considered a good job.

As I can prove from my own experience that this is a fact (and I believe every contractor in the room can prove a like experience), we should endeavor to inform the architect and owner in a better and more systematic way of the comforts, convenience and necessities furnished by electric service.

Fixture Outlets.

With the introduction of the tungsten high-efficiency lighting units, an immediate change was found necessary in the scheme of locating and supporting these lamps, and today we find in properly designed installations, more outlets of a minimum candlepower and always high enough to prevent a direct glare from the lamp into the eyes.

In residences, this means in very large rooms, two, four, five or six 25 to 60-watt individual pendants close to the ceiling, instead of 6, 8 or 10-light chandelier, in the center of the room and coming down as low six feet, two inches, from the floor. In the smaller rooms, one or more 25, 40, 60 or 100-watt lamps are used for general illumination and a 15 or 25-watt lamp for the dresser. In the bath room, a 25-watt ceiling lamp, with a 15-watt lamp on each side of the mirror for shaving, and a 15-watt lamp in the closets, will give ample light.

Plug Outlets.

Now, in addition to these permanent fixture outlets for lighting, it has become neccessary, because of the socket being close to the ceiling, to provide plug outlets for portable lamps.

You will find today portable table, piano and stand lamps on sale, not only in the lighting-fixture stores, but in jewelry stores, hardware stores, department stores, and, I am told, even in the ten-cent stores, and you can hardly find a home using electricity that has not at least one, and usually several, portable lamps. Therefore, the architect and owner should provide for the convenient connection of such portable lamps. Strange as it may seem, the architect specifies Underwriters' inspection and a certificate for the original installation, and then, by *not* providing for convenient connection of portable light, heat and power devices, endangers the owner's property when temporary and unsightly connections are used for such devices. It is acknowledged to be a fact that there is danger in the temporary wiring, when used for permanent connections.

As to the number and location of plug outlets, I have in mind an installation where I recommended at least one receptacle in each room and hall on the first and second floors. As the owner purchased his furniture, he found that the locations decided on for these plug outlets did not suit the location of the furniture and we put an additional plug outlet in each room, and after the owner moved into the house he told me he had only one kick coming on the job, and that was that he had not put a plug connection in each of the four corners of each room and hall. As this man is in the electric business, we might excuse him as trying to overdo the good work, but it is a fact that the housewife may want to move the piano, desk or any other piece of furniture into any one of the four corners of the room. Then why not provide for the lighting of the piano or desk in any position that might be convenient or suit the idea of the owner. We would provide for plug outlets about as follows:

Entrance Hall.—At a convenient point, a stand or table lamp for general illumination.

Parlor.—Piano lamp, also table lamp.

Living Room.—Table lamp in center of room, desk lamp for writing desk and lamp for lighting book-case.

Dining Room.—Stand or table lamp for general illumination.

Bed Rooms.—Table or bed-clamp lamps.

These few plug receptacles will cost very little when installed during the construction of a house, and will make a better job with a minimum length of attachment cord to the portable lamp.

Before leaving lighting outlets, I want to suggest something that I believe is new (as we have never seen it specified, but have installed it ourselves) for first-class installations, and that is to specify a separate circuit for the ceiling lamps and a separate circuit for the brackets, toilet or plug outlets. With the advent of innumerable heating and cooking devices, the blowing of a circuit fuse has become a regular thing, not from any fault of the lighting system, but entirely on account of overloading the fuse by adding a device that was not intended to be connected to the circuit in addition to the lamps, and the owner will appreciate the benefit of a second circuit in the room when the fuse blows on the first one.

Switches.

Strange as it may seem, we have just as much trouble today convincing the architect and owner that the job requires two, and sometimes even three, switches to control the lights properly in the main rooms, as we used to have ten years ago in convincing them that they should have at least one switch, but the necessity for more switches in the principal rooms should be immediately appreciated when we realize that the lamps and sockets are today, in a properly designed installation, close to the ceiling, and for the convenient and economical use of the electric service there must be plenty of switches.

Let us start this time from the porch. One switch for either one or more outlets is usually sufficient.

Entrance Hall.—Here we should have one switch that will control just enough light for the general illumination. This switch should be in combination with a switch in the rear of the hall, one on the second floor and sometimes even one on the third floor. These combination switches for the hall and stair lamps will pay for themselves many times in the course of the occupancy of the building. Besides the combination switches for the general illumination, there should be a second switch to control the balance of the lamps on the fixture.

Parlor.—The parlor should be equipped not only with two switches for the ceiling lamps, but, on account of the usual style of fixture, with switches for brackets also, if brackets have been decided on.

Living Room.—One switch should be prepared for the reading or table lamp, and not less than two switches for the ceiling outlets, one for the general illumination and one for the better illumination.

Dining Room.—One switch for ceiling lamps for general illumination; in many cases this should be in combination with a second switch placed at the door to the pantry, which will pay for itself by less damage to glass and chinaware. A second switch for the balance of the ceiling lamps, and if brackets are used, here again they should be controlled by a switch.

Kitchen—One switch.

Pantry.—One switch.

Basement Stair.—One switch, and it will be better yet if in combination with another at foot of stairs.

Second Floor Hall.—If this hall requires only one lamp, it of course should be arranged with a switch in combination with a second switch on the first floor, and a third switch if there is a third floor. If more than one lamp is required for the second floor hall, it will be found economical and convenient to have a second switch for the balance of the lamps on the fixture.

Bed Rooms.—Here again, if the room is large enough to justify more than one-lamp ceiling fixture, it will be found both economical and convenient to the house owner to have one switch for the general illumination and a second switch for the balance of the lamps on the fixture.

I wish to say that from my personal experience it is far better to install two

or more separate switches than to use what is known as an electrolier switch, as with a separate switch you turn on and off just the light you want, while with an electrolier switch you must turn on everything to get what you want, and in my opinion it is false economy, as the additional cost of the separate switch per section controlled amounts to only about 75 cents.

Bath Rooms.—A switch should always be used for the ceiling lamp and, as a matter of fact, a switch should also be used for side lamps, as, even though using the greatest care, a person turning on a light with a key or pull socket might have the other hand touching a plumbing fixture or actually in the water, and through a defective connection in the socket or fixture receive a severe shock. Where a bath room is used for two bed rooms, it will be found of the greatest convenience to use two and even three switches in combination, so that regardless by what door the bath room is entered, a switch is conveniently at hand.

Closets.—The convenience of a closet lamp can only be appreciated by those using them, and the benefits derived from an automatic switch are even greater than when the closet lamp must be turned on and off every time you want to get something in or out of the closet. The objection I have heard voiced against automatic closet switching is that the closet cannot be properly aired and taken care of and that there is a waste of light when the door is opened, but this can be remedied by a key socket so that the light can be turned off when desired. However, the convenience of an automatic switch in giving light the moment the door is opened should certainly be appreciated.

We should not forget that the greatest argument in favor of electric lighting service is its application and control.

Power, Heating and Cooking Outlets.

It really seems wonderful how the development of the vacuum and suction electric sweeper has made it practically necessary to have electric power service in the up-to-date home, for even the doctors are today advocating the electric sweeper for hygienic reasons.

I believe that the architect is entirely excusable in not providing for electric power service as a separate and distinct proposition from the lighting service, for the reason that all we have to do is pick up a trade paper and we will probably find illustrations of electric current-consuming apparatus and devices taking anywhere from 50 to 2,000 watts, shown connected with the key socket of some lighting fixture. If the greatest manufacturers in the electric business advertise like this, the architect certainly can be excused for not knowing better. But this is only another proof of the fact that the electric business has really grown beyond the conception of the very people working on these developments, and one of the most serious problems to be considered by the electric inspection bureaus is the taking care of electric current-consuming devices of all kinds and capacities in connection with old installations. However, we should all of us try to keep the architects and building public informed of the actual requirements for original installations of electric systems in the home.

In the past two years, I have advocated for the average home one separate circuit of No. 12, and if possible No. 10 wire, to take care of heating, cooking and power connections. We have advocated for the past five years the fusing of lighting circuits of 660-watt capacities and less with 10-ampere fuses, this to take care of not only the lamps on the circuit, but also connections for curling iron, milk warmer, small stove, percolator, toaster and the like. However, since the advent of the vacuum and suction cleaner, we have had no end of trouble with the blowing out of circuits fused with 6 and 10-ampere fuses and have found it necessary for nearly all makes of vacuum and suction cleaners to fuse the circuit with 15-ampere fuses. This, we think, is too much capacity for the small wiring of the lighting fixtures, and therefore our argument in favor of the separate circuit of No. 12 or No. 10 wire.

For the average home, this circuit should have a plug outlet, usually convenient if placed in the base board for the vacuum and suction cleaner; but for cooking and heating devices that can be used in the kitchen, pantry, dining room and bath room it will be found far more convenient to place the receptacle about four feet, six inches, from the floor, with a finished plate flush with the wall, and here it is also a great convenience and a preventative of the expensive burning out of the device if a combination plug, switch and indicator-lamp outlet is installed for the cooking and heating devices.

With this separate circuit for the power and heating conveniences, we eliminate the trouble from the lighting circuits, and this power circuit can without danger be fused for even as high as 20 amperes, if a No. 10 wire is used, and in that case can be used for connecting from 1,000 to 2,000-watt electric radiators. This is one of the most practical and convenient of devices for getting a satisfactory temperature quickly in the bath or dressing room. When the owner understands that by running a 1,000-watt radiator in the average bath room for 15 minutes he can raise the temperature from 66 to 74 degrees Fahrenheit, he will appreciate not only the comfort and convenience, but also the economy in cost of such service. On this same circuit, we can connect the ventilating fan for the kitchen, also one for the laundry, the washing-machine motor for the laundry and the heavy electric iron for the laundry work. In fact, we have never yet had an owner refuse the expense of a separate No. 12 or No. 10 power circuit, according to the size of the house, after hearing of the benefits of such a circuit. Of course, it must be understood that the larger the house the more of these circuits should be installed, as in a large house it might be possible that the vacuum or suction cleaner would be used at the same time the electric radiator or other large device or apparatus was in use, and in fact it would cost but very little more in the larger house to run one No. 12 or No. 10 circuit to the bath and bed rooms, one to the kitchen, pantry and dining room, one to the laundry and a separate one for the vacuum cleaner, although in the larger house the stationary vacuum-cleaner outfit will undoubtedly give the best service. Here again the architect should provide for the up-to-date method and specify a remote-control switch on a separate circuit, placed at the location of the vacuum-cleaner motor and controlled by switches installed next to the mouth or outlet of the vacuum pipe in all parts of the house.

It will be impossible for me to enumerate all the appliances and devices that are on the market today for the economical, practical and convenient application of the electric service to the comfort and satisfaction, as well as the health, of the home. Instead, I would suggest that you visit at your earliest opportunity the so-called electric shops that have appeared in our business centers during the past few years, and then only will you be able to appreciate the development of electric current-consuming apparatus, appliances and devices for power, heating and cooking.

Among the Contractors.

Bond Brothers & Company, of Evanston, Ill., have just finished the electrical work in the S. S. Greeley School building, at Winnetka, Ill., and that in the buildings of the Joseph Sears School, at Kenilworth, Ill. These were both thoroughly modern high-class installations. This firm has also recently secured the contract to do the wiring in the new Rosenwald cottage for the Hull House Association at Waukegan, Ill.

Claude C. Matlack, president of the Claude C. Matlack Company, of Louisville Ky., a leading dealer in electrical fixtures and supplies and prominent in contracting circles, took a prominent part in the Burns lecture at the Fourth-Avenue Baptist Church in that city.

when tales of the industries, life and feuds of Kentucky mountain folk, illustrated with stereopticon views, were related in a highly interesting fashion.

The Beers-Offut Construction Company, of Ft. Wayne, Ind., has been awarded the contract for the construction of the municipal light and power plant of Kendallville, at a cost of $43,000.

The contract for installing a system of outline lighting on the Broadway Bridges in Portland, Ore., has been awarded the West Coast Engineering Company.

Installing Outlet Boxes in Reinforced-Concrete Buildings.

In the construction of buildings of any one of a number of different types the installation of the electrical equipment can be begun when a certain point in the work on the house has been reached and, when once begun, it can be carried on without interruption until the roughing-in has been completed. On the other hand, there are many buildings whose construction is such that the installation of the conduits, outlet boxes, etc., must commence relatively early and must then be carried on at a rate depending on the progress of the rest of the work. Sometimes in buildings of this kind it is necessary to keep one or more electricians on the job for a long time without their being able to work more than a small fraction of any day, the cause of this being that a part of the conduit installation has to be put in piecemeal and that the putting in of each section of this part of the work has to wait until the builders are ready for it and the section must then be installed very promptly, so as not to cause any delay in the completion of the parts of the building where such electrical work is located. For example, it is usually very important that somebody be on hand all the time to look after the electrical work while the floors in a reinforced-concrete building are being put in. Here, in fact, it is not simply a matter of having each section of the roughing-in done promptly when the men building a floor are ready for it; somebody should be present to make sure that conduit runs and outlet boxes are not disturbed after they are in place, by the workmen pouring the floor.

Fig. 1.—The Usual Method of Installing Outlet Boxes.

Fig. 2.—Installing Improved Form of Box.

As electricians with experience in reinforced-concrete buildings know, the concrete for the floors is poured in wooden forms, or boxes, which are all torn away after the concrete has set. The ceiling outlet boxes are placed on the bottoms of the forms at the proper locations for outlets, and the lines of pipe run to them before the concrete is poured. Then, if all the work is properly done, when the wooden form is finally removed every box will be found in the right place, with its lower edge flush with the surface of the ceiling. But where the proper precautions are not observed it may easily happen that careless workmen engaged in building the floor will push boxes out of place to one side or the other, leave them tilted so to make it difficult to get the fixtures to hang true, or even lift them entirely off the wooden form and inclose them completely in concrete, thus making it hard to find the box when the wires are to be pulled in or the fixtures hung, after the form has been torn down.

Methods of fastening outlet boxes in place devised by the electrician on the job have been described in these columns. But the best of such methods are relatively quite expensive and rarely ever altogether satisfactory otherwise. Hence manufacturers of conduit fittings have lately undertaken to provide for the difficulties mentioned in the design of the outlet box itself. A box which the Adapti Manufacturing Company, Winter and Leonard Streets, Cleveland, O., expects to place on the market is illustrated in the accompanying figures. The bottom or back of this box is detachable and at the outer edge (the lower edge when the box is in place in the ceiling) two ears are provided, each one of them having a hole in it through which a nail can be driven into the floor of the wooden form. These nails, which hold the box securely in place while the floor is being built, can be readily pulled out when the form is to be taken away.

An advantage in the use of this type of box even greater, perhaps, than that just referred to is that but one man is needed to install it and attach the conduits. In Fig. 1, two workmen are seen attaching the conduits in an outlet box having the back made solid with the walls. One man holds the box up off of the form while the other screws the locknuts into place. Fig. 2 shows how the job is done where the new type of box is employed. The box is nailed in place, and with the cover removed the locknuts screwed tightly on. Then, the fixture stud having been attached to it, the bottom is put back on the box, and job is complete. Thus but one man need be kept on hand to look after such work, and the electrical contractor can be sure that when forms are torn down all boxes will be found in the right place with studs pointing vertically downward.

New Safety Fuse and Cutout Switch.

Patents have recently been issued to Louis Kovacs, 317 South Peoria Street, Chicago, Ill., for a safety fuse and for a cutout switch.

The safety fuse is illustrated in Fig. 1 and has as its essential object to provide a construction in which the plugs for a given current rating cannot be connected with a base designed for a lower current rating. With ordinary bases it is very common to replace fuse plugs by others of a carrying capacity higher than that for which the circuit is designed and this is likely to result in overloading the circuit and an increase in the fire hazard.

This safety fuse consists of two parts, a base-block and a fuse-plug, the connections being made to the block. The fuse is carried in the plug. Both parts are represented in Fig. 1 in cross-section. The current enters at the terminal screw *45*, passes through the plate *44* to shell *18* and its flange *19*. Connection is here made to the sleeve of the plug, *24*, from which the current goes through the screw *25* and the fuse *41* to the contact rod *38*. Contact is made between this rod and rod *10* of the block, which projects to a distance suitable for this purpose. From contact rod *10* the current passes through cup *4* to cup *3* and thence to the terminal screw *49*. The current must pass from contact rod *38* to contact rod *10*, which rods are held in contact with each other by the action of the helical spring within the telescoping cups *3* and *4*. The contact rod *10* is rigidly attached to cup *4* and the spring is adapted to normally hold the cup *4* at the upper limit of its movement.

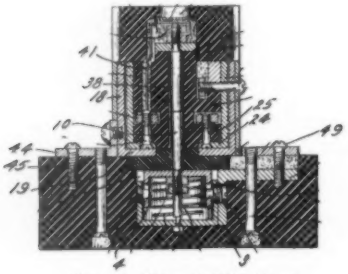


Fig. 1.—New Safety Fuse.

Fuse plugs of different carrying capacities differ not only in having fuse wires of given current rating, but in having different lengths of contact rod *38*, the length of each of said contact rods being proportioned to the amperage which can be carried by said fuse wire. Corresponding to these, the rods *10* in the base-block are made of suitable lengths, and consequently only a plug of the proper rating can be mounted in a base of given rating. Any plug of higher rating will fail to make contact with rod *10* and any plug of lower rating will fail to seat itself, owing to the fact that rod *10* projects too far to fit it, or will blow out if forced.

The current-carrying parts of this safety fuse are made of brass or copper, and the insulating parts of porcelain, ebonite or fiber.

The cutout switch makes use of the same principle as the safety fuse and is shown in Fig. 2. A large part of the blade of the switch is replaced by a cartridge containing a fuse wire adapted to blow out at a given amperage, and a contact rod, the length of which is proportioned to the amperage at which the given fuse wire will blow out. The socket or base contains a contact rod which is movable, and adapted to be used with a cartridge of the same rating only.

Each socket or base is adapted to be used for a single rated current strength, but it is impossible to use a cartridge designed for a given amperage in conjunction with a base designed for a lower amperage. On the other hand it is impossible to use a base designed for a given current strength in conjunction with a cartridge which is rated for a higher current strength.

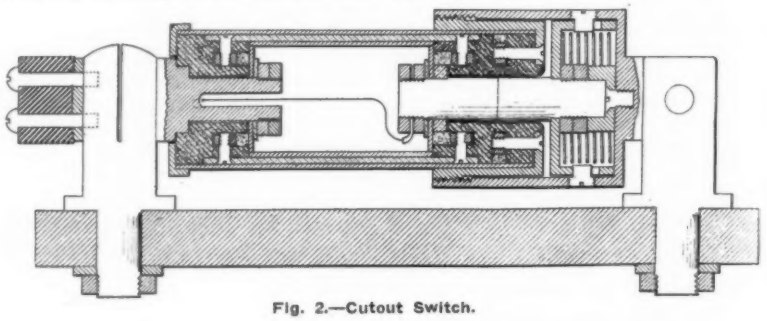


Fig. 2.—Cutout Switch.

The contact rods in the two parts must be of a length for the same current rating in order to make proper contact, and the length varies with the rated amperage of the base or of the cartridge and is different for each current rating. It is thus impossible to assemble a switch with parts which do not correspond in current rating.

The two parts may either be screwed together, or connected by means of two screws on the cartridge, which engage corresponding slots in the shell of the socket.

Licenses Advocated in Pennsylvania.

Pittsburgh Jovians have adopted resolutions favoring the passage of a state law that would compel all electrical contractors to take out licenses. It was also agreed to start a campaign for a thorough inspection of all fires which are reported to be caused by crossed wires.

In two months recently 142 old houses were wired for electric service in Nashville, Tenn., a city of about 120,000 inhabitants.

Ludicrous Wiring Specifications.

The insufficiency of the specifications provided in many cases for electrical work is well illustrated by two extreme cases which come to our attention through John S. Musser, president of the Dauphin Electrical Supplies Company, Harrisburg, Pa. These specifications were handed out by a prominent architect in a city of 100,000 inhabitants.

Front-Door Bell.

Provide and hang where required a good nickel-plated bell with plate to match other hardware. Bell to be conveniently located in the pantry; insulated copper wire and battery to be provided; wires to run behind plastering. Push-buttons to match hardware in rooms.

Electric Lighting.

The whole house shall be wired for electric lighting; the light shall be properly flush-switched from the side walls at convenient places and carried up and down the stairs; also the cellar and rear yard.

Electric Wiring.

Properly furnish and put in the required insulated wiring of the best copper of suitable sizes for the required lights where designated on the plans, or at the owner's direction. All wiring to run behind and before the plastering is done. Put in all necessary switches of flush pattern and connect with the outlets for lighting. The first floor shall be connected with the second as also the second with the third and the cellar and porches. The outlets of the wires and gas to come together so combination fixtures can be used.

Moving-Picture Requirements in La Grange.

The municipal authorities in La Grange, Ill., require that the arc lamp for any moving-picture machine operated in that town be controlled by a double-pole switch and cutout, and the switch must be within easy reach of the operator of the machine. Conductors supplying current to the lamp must not be smaller than No. 6, B. & S. gauge. If a resistance box or rheostat is used, it must be kept not less than one foot from any combustible material, and must be separated therefrom by means of a slab of slate or marble.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Using Conduit as a Speaking-Tube.

It may be interesting to note that runs of conduit, either rigid or flexible can be used as a speaking tube. Say, for example, with the electrician at one end and the helper at the other end of the run, the one desiring to send a call has only to shout through the tube as a signal. Then the tube may be used in the same manner as any ordinary speaking-tube outfit would be used. This idea may, of course, be used to the best advantage at the time the conduit is being installed.

W. A. Murray.

Tool for Splitting Duplex Wires.

In Fig. 1 there is shown what I find to be a very handy tool for splitting duplex wires. It is made of a nail and a piece of white-pine board. The point of

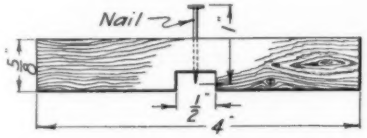


Fig. 1.—Tool for Splitting Duplex.

the nail should be sharp, of course, so as to cut the insulation readily.

William Schmitter.

Good Way for One Man to Install Long Lines of Open Work Quickly.

Quite recently I was called upon to install several lighting circuits of No. 10 wire with two-wire cleats fastened to the floor joists of the room above that in which the circuits were to be run. The circuits were 100 feet long and the joists ran crosswise the room. Being alone, and not having any kind of a wire-stretching device, I made use of the following scheme, which worked splendidly.

I started my lines at one end of the room and cleated them up permanently there. I then measured the distance of the cleat here from the outside wall and made a mark on a joist at the other end of the straight run the same distance from the wall. Then I pulled both wires as tight as I could by hand, and, cutting them off the same length, twisted the ends together (insulation and all) so that the wires when fastened would be about even with the next joist past where I wanted my last pair of cleats. I then placed my step ladder in proper position facing the work at this end of the circuit. As the next step, I took a piece of seven-eighths-inch board, 4 inches wide and 24 inches long, placed one end of this through the loop in the wires just far enough to pass up behind the floor joist, and taking hold of the other end, I used the board as a lever, which enabled me to pull the wires as tight as I pleased. I had a pair of cleats ready. I placed the lever over my shoulder, which left both hands free to fasten the wires up permanently, in a perfect line, tight, and ready to be cleated throughout the whole circuit.

W. A. Hines.

Setting Outlet Boxes at an Angle.

Part of the illumination of a large store in which the writer works is

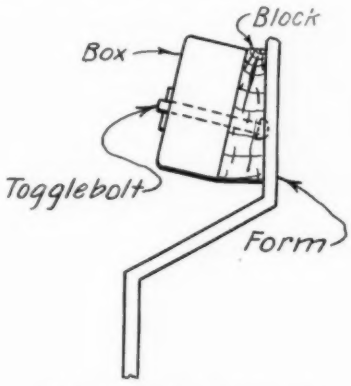


Fig. 2.—Outlet Box at an Angle.

provided for by means of outlets placed around the edge of the ring at the first-floor ceiling line. It was necessary to set these boxes at an angle of 15 degrees from the perpendicular, and as they were to be set in reinforced concrete it was also necessary that they be rigidly secured in place in order to preserve this angle exactly. There were 250 to be set. This was accomplished in the following manner. A piece of 1 by 6-inch lumber was split diagonally. This gave a block which when placed against the form gave an angle of 15 degrees. These blocks were cut larger than the box. The boxes were connected together by nipples. Then the block was fastened to the box by means of an ordinary toggle bolt and the block nailed to the form. When the forms were stripped the blocks split off and a couple of twists with a pair of pliers took the toggle-bolts, out leaving the boxes securely in position.

Charles M. Claiborn.

Commutator Truing.

If a file is used, chalk it well to prevent the teeth "pinning" or filling with copper filings; use it backwards for the finishing touches. Work in a wooden block, at least as thick as the commutator is long, a semi-circle just the diameter of the commutator, and use glass cloth as a lining for this, to work the commutator down true; move the block axially while pressing it on the commutator.

Emery paper should not be used, as emery, being an iron oxide, is a conductor and will ruin the insulation.

Robert Grimshaw.

A Tool Convenient in the Installation of Steel-Armored Cable and Flexible Conduit.

In wiring already-built houses, difficulties are sometimes encountered, after dropping a run of steel-armored cable or flexible conduit in a wall to a switchbox, in making the fittings set straight in the box. Such troubles as these may be easily overcome by the use of a tool like that shown in Fig. 3. This tool consists of a piece of one-eighth-inch steel rod bent as indicated in the figure. By means of this the wireman can very easily turn the box

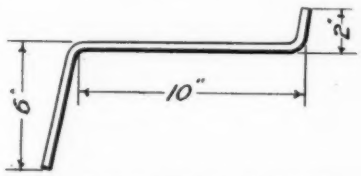


Fig. 3.—Tool for Truing Outlet Box.

into the desired position, where it can be secured with the proper locknut.

J. B. Wathour.

Mounting Porcelain Receptacles.

It is often desirable to mount porcelain receptacles, rosettes, switches, etc., on boxes and in other places where the porcelain is liable to be broken because it has to be screwed up extra tight with machine screws. To overcome this I put one or two lead washers on the screw before inserting it. This also overcomes any tendency of the screw to back out or come loose, as the lead holds the screw very firmly.

E. W. Dullea.

Copper Exports.

Exports of copper for the week ended March 19, totaled 5,589 tons. Since the first of the month, 24,627 tons; same period last year, 19,067 tons.

Public Service Commissions

NEW JERSEY.

The Board of Public Utility Commissioners has granted the application of the Public Service Electric Company for lease of the property and franchise of the Cinnaminson Electric Light, Heat & Power Company, operating at Cinnaminson, Burlington County. In approving such lease for a period of one year, the Board recommends the Public Service Company to arrive at a plan which would result in the simplification of the corporate relations between the two companies, whereby the Cinnaminson company may be merged with some one of the operating companies belonging to the Public Service Electric Company.

The Supreme Court has handed down an opinion, affirming the order of the State Board of Utility Commissioners, refusing permission to the Inter-State Telephone & Telegraph Company to issue $1,525,000 five-per-cent refunding mortgage gold bonds. The company asked the sanction of the Commission to the issue for the purpose of exchanging the bonds for an issue of upwards of $2,900,000 in bonds which were to be retired. The plan was part of a scheme for refinancing the company.

NEW YORK.

Last week the Public Service Commission for the First District signed the contracts for the Dual System of rapid transit, which had been duly approved by the Board of Estimate and Apportionment after their adoption by the Commission.

A writ of certiorari issued by Justice Davis of the Supreme Court upon application of the New York Edison Company, has been served upon the Public Service Commission. The writ calls for a review of the Commission's order granting the Long Acre Electric Light & Power Company power to issue $4,000,000 in bonds, $2,000,000 in capital stock, and to proceed with the construction of a plant for production of electric light and power.

The capital stock and bond issues allowed were granted upon the application of the Long Acre Company for permission to issue $10,000,000 in stock and $50,000,000 in bonds. Action of the Public Service Commission in granting the orders was taken after the case had been sent back from the Court of Appeals with instructions that a certificate of public convenience and necessity was not necessary inasmuch as the company held a perfectly good franchise.

The Inter-Village Electric Corporation has been authorized by the Public Service Commission, Second District, to exercise a franchise for electrical distribution in Hamburg, Erie County; to issue its capital stock for $5,000 and its first-mortgage bonds for $12,500. The company proposes to purchase the property of the Howard A. Pierce Electric Light Company of Hamburg.

The Commission has authorized the Elmira Water, Light & Railroad Company to sell $339,000 of its first consolidated mortgage five-per-cent, 50-year, gold bonds to refund a like amount of bonds of the Elmira Water Works Company.

The Commission has given its consent to the Schenevus Electric Light & Power Company to transfer to the Great Bear Light & Power Company all its property and franchises and to the Great Bear Light & Power Company to exercise all rights and privileges under the Schenevus franchise in the village of Schenevus. The Great Bear Company is authorized to construct, maintain and operate an electrical transmission line from its plant in Worcester, Otsego County, through that town for the purpose of connecting with the lines of the Schenevus Company. The Great Bear Company is also authorized to exercise franchise for the furnishing of electricity in Maryland, Otsego County.

The Commission has authorized the Orange County Telephone Company to issue its five-per-cent gold mortgage bonds to the amount of $50,000, the bonds to be sold at not less than 95 per cent, and the proceeds to be used for construction of a new building, new switchboard, a subway and underground and aerial cables.

The Commission has authorized the Niagara Light, Heat & Power Company, doing business at Tonawanda, N. Y., to issue its consolidated and refunding bonds to the amount of $60,000, the bonds to be sold at not less than 80 and the proceeds used for the payment and discharge of current liabilities incurred for proper capital charges.

MISSOURI.

A public utility commission has been created by a bill which was signed by the Governor on March 18. This bill was modeled along the lines of the New York law, and repeals the present law permitting the establishment of local commissions for the regulation of local utilities.

CALIFORNIA.

Subsequent to an appeal of the Pacific Telephone & Telegraph Company to the Supreme Court against the order of the Railroad Commission requiring physical connection with the Tehama County Telephone Company and the Glenn County Telephone Company, the attorneys for the Commission appeared before the Supreme Court and waived all technical proceedings, offered to stay the Commission's order pending the hearing before the Supreme Court, and asked that the whole case be reviewed without delay, upon its merit.

A decision was rendered granting authority to the San Diego Consolidated Gas & Electric Company to issue $106,000 of six-per-cent debentures. The original application was for $500,000. The proceeds will be used to discharge indebtedness.

A decision was rendered granting the application of E. W. Crosby to sell, and of the Reedley Telephone Company to purchase, the Reedley telephone exchange plant. The Reedley Telephone Company was also granted authority to issue $11,000 of stock.

A decision was rendered granting the application of the Great Western Power Company for authority to issue $4,411,000 of bonds. The proceeds will be devoted to general improvement, extension and development of the company's facilities. The Big Meadows Dam and Reservoir will be completed at a cost of approximately $1,607,635.

A decision was rendered granting authority to the Southern Sierras Power Company to purchase the Elsinore Electric Light and Power Company, at Elsinore, for $7,500.

MAINE.

The legislature of Maine has passed a bill creating a Board of Public Utilities. The Board is composed of three men, to be appointed by the governor; the first Board for terms of seven, five and three years, the regular term thereafter to be seven years. The Commission has power to regulate all public utilities in the State. The chairman re-

ceives a salary of $5,000 and the other two members $4,000 each. With the creation of the new board the Board of Railroad Commissioners and the Water Storage Commission will be abolished. The terms of the act follow closely the Wisconsin law, with minor changes.

WISCONSIN.

The Wisconsin Railroad Commission has made a decision holding that the Beloit power house of the Rockford & Beloit Interurban Company is not needed and that the Rockford Electric Company is properly equipped to supply power to the interurban company. Such duplication of plant is not favored.

Among the Supply Men

The Harry I. Wood Company, Louisville, Ky., is making a special sales campaign on Ericsson telephones and telephone supplies. J. L. Damble, sales manager, reports business in very good shape.

The Illinois Electric Company of Los Angeles, Cal., has secured the services of James G. Pomeroy as general sales manager. Mr. Pomeroy was for years connected with the Adams-Bagnall Electric Company of Cleveland, as its western manager, with headquarters in Chicago. About two years ago he went to Cleveland as general sales manager of the company. Last October Mr. Pomeroy retired from active work and with his family moved to Los Angeles, where Mrs. Pomeroy particularly might have a chance to recuperate. It seems that "Jim," as he is familiarly and affectionately known, could not stand the dissipation of idleness, and the Illinois Electric Company, with its usual enterprise and good fortune, snapped him up.

A well stocked and well appointed store for the handling of electric fixtures and lighting equipment has been opened at 307-309 West Walnut Street, Louisville, Ky., by Henry J. Rueff. Mr. Rueff was for 10 years in charge of the lighting fixture company of the Wuerst Plumbing Company of Louisville, and for the past five years has been connected with the Hegan Manufacturing Company, one of the leading fixture concerns of the Ohio Valley.

The Central Electric Company, Chicago, Ill., is distributing the March issue of *Electron*, its interesting little magazine devoted to the development of the electrical industry. Among the articles is a description of the illumination of the Firestone Tire & Rubber Company's office in Chicago, which is lighted with Alexalites. Another article is by Louis R. Christie, entitled "The Critical Architect and the Careless Contractor." There is also a reproduction of a recent photograph of George A. McKinlock, president of the Central Electric Company, together with a personal sketch, which is not only interesting because of the information it gives us with respect to Mr. McKinlock and some side lights on his personality, but because of the historical information conveyed with regard

Cover Design of Central Electric Company's Magazine.

to early days of the institution and the personnel of the organization. The cover, which is in colors, is very attractively printed and is reproduced herewith.

The Central Electric Company, 320-326 South Fifth Avenue, Chicago, Ill., has ready for distribution its discount and price book applying to its catalog No. 28. This book is replete with information not only respecting prices, but carrying in addition descriptive matter set forth in the briefest possible way. There are also numerous illustrations of some of the material listed. Copies of this discount and price book will be sent to those interested upon request.

M. B. Austin & Company, Chicago, Ill., reports that it is selling hundreds of thousands of feet of Safety steel-taped cable for ornamental street lighting. The company has furnished the cable for more than 100 cities during 1912, and has closed in the first two months of this year contract with 14 cities, with a number of excellent prospects for closing up during March. The Austin standards for ornamental and practical street lighting are being rapidly introduced, the biggest showing being made throughout the southwest, with a strong following in Michigan and Iowa. In addition to the extensive sales of steel-taped cable for all kinds of underground service, there is a heavy demand for Safety paper-insulated and lead-covered cables for high-tension underground transmission, while the demand for Safety Ruby Core for wiring jobs of every description is surpassing all expectations.

A. H. Friend, for 18 years the company's active representative, is making the circuit of St. Louis, St. Joe, Kansas City, Omaha, Sioux City, Minneapolis, St. Paul and Milwaukee.

R. J. Thorne, the company's Michigan representative, has just closed a contract for six miles of three-conductor, 450,000-circular-mil, high-voltage Safety paper cable.

M. R. Lash, sales engineer, has his hands full working out the details of a number of underground installations. The company has published a very interesting bulletin devoted to the characteristics and application of the Austin standards and Safety steel-taped cables. This will be sent to interested parties on request.

Louis A. Schwab, president of the Monarch Electric & Wire Company, Chicago, Ill., writes that his company is receiving a great amount of business on galvanized steel strand and on weatherproof iron wire for signal work and telephone construction work. He reports that the supply business in general is very satisfactory.

Thirty Years Ago.

Electrical News of 1883 as Presented in the "Electrical Review," the Only Electrical Weekly Published in the United States at that Time—Second Installment.

(From "Electrical Review," N. Y., March 29, 1883.)

Telephone stocks are held very largely in Chicago, where they command large figures. Indianapolis does not come far behind, as people there are investing in them for permanency.

The Western Electric Company, of Chicago, Indianapolis and New York, is erecting in Chicago a new factory, which will be ready for occupancy by August. It will be the largest of the kind in the world.

A jury in the Supreme Court has decided that the poles erected by the Metropolitan Telegraph & Telephone Company on Twenty-first Street, between Fifth and Sixth Avenues, are a nuisance to the public.

To France belongs the credit of having first discovered the advantage of lighting the coast with electricity. It has been found that the electric light shows clear and steadily when the oil lamps, backed by their large and costly lenses of cut glass, are obscured.

A Pittsburgh girl who had refused a good looking telegraph repairman three times within six months gave as a reason that he was too much of a wanderer; that he roamed from pole to pole, from one climb to another, and if he did come home, he'd be insulate and the neighbors would be sure to talk.

Dr. Siemens, in his address to the London Society of Arts, showed that arc lamps were cheaper than incandescent lamps and that both would be decidedly cheaper than gas lighting if the electric companies had the opportunity to make sufficiently large plants and the gas companies continued to pay their present large dividends.

M. Gaston Tissandier is engaged upon the problem of aerial navigation by electricity. His idea is to furnish his machine with buoyancy by means of gas and a lateral movement by electricity. He has discovered that an electric motor of the Siemens pattern, driven by a bichromate battery, the whole not exceeding the weight of three men, is capable of furnishing regularly for three consecutive hours the work of nearly 15 men (!!).

The certificate of incorporation of the Telephonic Telegraph Company was filed in the County Clerk's office in this city on Wednesday last. The object of the new company is to construct and use lines for the simultaneous transmission of telephonic and telegraphic messages. The instrument used is the invention of Abner M. Rosebrugh, of Toronto, and George Black, of Hamilton, Canada.

The conclusions of the New England Cotton Manufacturers were: "Electricity forms the safest method of illumination when the following facts are observed: The system insulated throughout, so that there be no earth communication, or from one part of the apparatus to the other, except through the proper conductors. All switches made with a lapping connection. Arc lamps provided with globes closed underneath, and the frame so arranged that the lower carbon can not fall out even if the clamp fails to hold it securely."

The Postal Telegraph Company on Saturday last opened its line for a private test between New York and Chicago, and everything worked perfectly. The resistance of the wire showed only 1,522 ohms, as against 6,000 ohms on the best iron wire and 15,000 ohms on the average iron wire. Professor Elisha Gray and H. Cummins, vice-president and general manager of the Postal Telegraph Company, conversed freely and distinctly with Mr. Taylor, the company's electrician in Chicago, a distance of 1,000 miles.

A series of experiments were made recently in the office of the Postal Telegraph Company, 49 Broadway, with Lockwood and Bartlett's new molecular telephone. The telephone was connected with the wire of the Postal Company running from this city to Cleveland, a distance of 650 miles, and over this wire conversation was held with Henry E. Waite, an electrician, and one of the inventors, who was stationed in the office in Cleveland. The Bell receiver and three or four other styles of instruments were tried, and all worked well over the line, which is of copper wire.

HARTFORD'S CONSERVATISM.—A great deal of disappointment has been expressed because Hartford is so far behind other cities in the matter of electric lights. The matter is just here. Hartford will have the electric light and have it in all its novelty and splendor. So far electric lighting has been only experimental. This system of illumination is not yet fully understood, but Hartford parties are soberly looking on and profiting by the experiences of more impulsive people, and when the right time comes the right kind of an electric light will be introduced here for general use, and the bill of expense for experiments will have been paid by those who taught Hartford how to avoid them. Be patient.

It is now proved to be possible to convey by means of electricity, vibrations of light—to not only speak with your distant friend, but to actually see him. The electroscope—the name of the instrument which has enabled us to do this—is the very latest scientific discovery, and to Dr. Gnidrah, of Victoria, belongs the proud distinction. The trial of this wonderful instrument took place in Melbourne on the thirty-first of last October. Sitting in a dark room, they saw projected on a large disk of white burnished metal the race course at Flemington, with its myriad host of active beings, and as they looked at the wonderful picture it was difficult to imagine that they were not actually on the course itself and moving among those whose actions they could so completely observe.

PLACING TELEPHONE WIRES UNDERGROUND.—Major Lydecker and Captain F. V. Greene, of the Corps of Engineers, U. S. A., say it is perfectly feasible to put most of the wires underground, and that the telegraph, electric light, and telephone trunk lines can be so disposed of. Captain Greene says: "The experiments now in progress in New York and Boston, and the long use of underground wires in London and other cities in Europe, prove incontestably that the underground system is perfectly feasible for trunk lines. The electric-light wires, the telegraph wires, and the trunk lines of the telephone can all be carried un-

derground with perfect success. The distribution of the telephone wires to separate houses in an underground system is attended with difficulties which as yet have not been overcome. I therefore recommend that the Commissioners pass an order prohibiting the further erection of any poles whatsoever on the public streets for carrying electric wires provided such poles as may be necessary for distributing telephone wires may be erected in the alleys."

Up to the twentieth of December last, (1882) 29,192 Edison lamps were in use in America. Up to the commencement of February of the present year, 19,536 lamps were in use in Europe.

A new method of insulating wire for electrical purposes has recently been adopted by the Triplex Insulated Wire & Rubber Company. The method consists in tinning the wire. It is then covered with a layer of soft rubber, around which a strip of soaked linen is wrapped, which in turn is covered by an outer layer of thick, hard rubber. For underground wires another layer is added.

At Tufts College, near Boston, a new course in electrical engineering has been established. The course is under the supervision of Professor A. E. Dolbear, one of the pioneers of the telephone, and eminent for his electrical inventions. This department embraces instruction in wood and metal work at the vice and lathe, practice in running the steam engine, and an extensive experimental course with electric and acoustic apparatus, with special reference to the application of telegraph, telephony and electric lighting.

SELF-INDUCTION IN DYNAMOS.—Self-induction in dynamos is a factor which has been overlooked in their consideration and must operate considerably in reducing their efficiency. No dynamo as now made has the theoretical efficiency which it ought to have, even allowing for waste by heating in the coils and Foucault effect. The reason, or at least one reason of this, as Dr. Muirhead has observed, is probably due to the self-induction in the coils. Actual measurements of this quantity show that in the Hopkinson-Muirhead loops it is less than in closed bobbins. Inventors will do well to turn their attention to this subject with a view to diminishing the self-induction in dynamos.

In following the development of electrical engineering, all the world is learning new terms and new language. Words which three years ago did not exist, or were understood only by men of science, are today in the common language of engineers and their workmen—tomorrow will be used by the general public. "Electromotive force" and "current," "volts" and "amperes" are becoming terms as well known as "pressure of water" or "cubic feet of gas," and it is necessary that this should be so, as the time is fast approaching when the public will find their quarterly bills for the supply of electricity made out in "volts" and "amperes," and will have a right to sue the local electric company if their daily supply of "current" is insufficient, or is given at a wrong "electromotive force."

Some Electrical Patents Issued in 1883.

March 13:

Electric battery, Paul Jablochkoff, Paris, France.

Electric arc lamp, Ludwig Piette and Franz Krizik, Pilsen, Austria-Hungary.

Electric testing apparatus, Charles J. H. Woodbury, Lynn, Mass.

Electromagnetic car brake, Harvey S. Park, Henderson, Ky.

Galvanic battery, Lyman D. McIntosh, Chicago, Ill.

[Among the advertisers in the ELECTRICAL REVIEW of March 29, 1883, were: Holmes, Booth & Haydens, Westinghouse Machine Company, Boulton Carbon Company, Alfred F. Moore, J. H. Bunnell & Company, American Electrical Works, L. G. Tillotson, Law Telegraph Company, Phosphor-Bronze Smelting Company, F. E. Kinsman & Company, Bishop Gutta Percha Works, Victor Bishop & Company, A. L. Bogart, S. S. White Dental Manufacturing Company, Ansonia Brass & Copper Company, Western Electric Company, A. G. Day, American Bell Telephone Company, Leclanche Battery Company, Patrick & Carter, Charles Williams, Jr., Electrical Supply Company, and Travellers Life and Accident Insurance Company.

(*Quotations from* ELECTRICAL REVIEW *of* ***April 5, 1883, will appear next week.***)

National Association of Electrical Inspectors.

THOMAS HENRY DAY, president, 59 Deerfield Street, Hartford, Conn.

JAMES BENNETT, vice-president, 524 Coristine Building, Montreal, P. Q.

WILLIAM LINCOLN SMITH, secretary and treasurer, Concord, Mass.

JAMES E. COLE, National Conference Representative, 11 Wareham Street, Boston, Mass.

Executive Committee:

H. S. WYNKOOP, chairman, 13 Park Row, New York, N. Y.

Frank R. Daniel, R. P. Strong, Henry E. Knight, Washington Devereux, James B. McCarthy, W. Lincoln Smith, James Bennett, C. W. Mitchell, George L. Collison, T. H. Fritts, James S. Meade, T. Henry Day, James E. Cole, Thomas D. McColl

Annual Convention of the National Association of Electrical Inspectors.

The tenth annual convention of the National Association of Electrical Inspectors was held in New York City on March 25. Sessions were held in the morning and afternoon at the auditorium of the New York Edison Company, and in the evening there was a banquet at the Hotel Flanders.

The morning session was called to order by President Thomas Henry Day at 10:00 a. m. Mr. Day pointed out that the Association had followed the plan of discussing such problems in inspection work as proved perplexing to the members, in the columns of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, and did not depend upon such discussion as could be had at the annual convention. Considerable discussion was also carried on through correspondence whenever the occasion demanded it. The discussion in an official section of a technical journal had proved most effective and there had been many expressions of appreciation of its helpfulness from persons who are not members of the Association. He thought this feature of the work should be given even greater prominence than at present. He also complimented the secretary, William Lincoln Smith, for his thoroughness in handling this feature of the Association's work, as well as the other matters pertaining to his office.

Mr. Smith then made his report as secretary and treasurer of the Association. It showed the present membership to be 103. Since the last annual meeting two amendments to the by-laws have been adopted; one changing the name to the National Association of Electrical Inspectors; the other providing for associate membership, which is open to persons not actively engaged in inspection work but having a professional interest in it. During the year the executive committee had published 717 answers to questions on inspection matters; 313 questions

had been answered by correspondence, since the answers were too obvious to require publication; 37 other questions were upon engineering subjects, and the authors were so informed by the secretary. Since the publication of these questions and answers began, five inquiries concerning the National Electrical Code and the American method of handling it have come to the secretary from abroad; two of these were from England, two from France and one from Japan.

The afternoon session was devoted to a discussion of proposed changes in the National Electrical Code as published in a bulletin lately issued by the Electrical Committee of the National Fire Protection Association and reproduced in our issue of February 22. No definite action was taken upon these suggestions, but a committee was appointed to confer with the Electrical Committee of the National Fire Protection Association concerning the changes. This committee consisted of J. B. McCarthy, George L. Collison and William P. Briggs.

Banquet.

Hugh T. Wreaks, of New York City, acted as toastmaster at the banquet which was held on Tuesday evening at the Hotel Flanders. He first called upon James Bennett, of Montreal, president of the Western Association of Electrical Inspectors, who in his address emphasized the value of the National Association and the exchange of ideas among inspectors which it made possible.

James H. Fenton, of St. Louis, and E. N. Davis, of Brookline, Mass., spoke along similar lines. Thomas Henry Day, of Hartford, president of the Association, gave a splendid talk on the human element in inspection. He thought that the inspector should associate with his client as much as possible, and he made it a point to spend much of his leisure time in this way. He also discussed the importance of co-operation with the architects. The latter usually welcome advice when it is tactfully given, and if such advice is given before a building is wired it may avoid a great deal of unpleasantness afterwards.

H. S. Wynkoop, of New York City, William Lincoln Smith of Concord, Mass., and James E. Latta, associate editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, were also called upon for brief remarks. Mr. Smith referred to the work of James E. Cole, of Boston, who is the Association's representative upon the Electrical Committee of the National Fire Protection Association, and proposed an expression of appreciation on the part of the Association for his work. This was unanimously passed.

S. W. Stratton, who had been announced as one of the speakers at the banquet, was unable to be present.

Election of Officers.

The following officers were elected for the ensuing year:

President, Thomas Henry Day, Hartford, Conn.;

Vice-president, H. S. Wynkoop, New York City;

Secretary and treasurer, William Lincoln Smith, Concord, Mass.;

Assistant Secretary, James E. Latta, Chicago, Ill.;

Representative upon the Electrical Committee of the National Fire Protection Association, James E. Cole, Boston, Mass.

Changes in the membership of the Executive Committee will be announced later.

A rising vote of thanks to Hugh T. Wreaks for his excellent work as chairman of the Banquet Committee was then passed.

The time on Wednesday and Thursday was devoted by the members mainly to attendance upon the sessions of the Electrical Committee of the National Fire Protection Association. A report of these sessions will appear next week.

Storage Batteries Discussed at Boston.

The Electric Motor Car Club of Boston met at the Thorndike Hotel in that city Monday evening, March 17, for its regular meeting and dinner. Plans for combination advertising were discussed, and the Executive Committee's recommendation to extend the radius of the Club's activities to territory within 50 miles of Boston was adopted.

William C. Little, of the Borland-Grannis Company, spoke of the commendable lack of knocking on the part of salesmen and agents at the recent Boston Automobile Show, and approved the spirit of co-operation that exists among the electric-vehicle fraternity in the city.

The Club then adjourned to the Edison Building, where a meeting was held under the auspices of the New England Section, Electric Vehicle Association. Fred M. Kimball, chairman of the Section, presided. The Section voted to employ O. S. Draper, in connection with the Motor Car Club, as business secretary, in charge of routine work of the Section.

J. W. Cooke, of the Electric Storage Battery Company, addressed the meeting on "Lead-Battery Characteristics." Mr. Cooke said the lead battery comprises 90 per cent of all batteries now in use. He urged the necessity of proper water for use in such batteries, that of Boston being good for the purpose. The recuperative power of the posted-plate cells was referred to as a great feature in the electric-vehicle industry. Mr. Cooke said that if this type of cell had been brought out earlier, the original failures in electric transportation would have been obviated.

A slide was shown on the screen, giving the curve formed in the discharge of a battery. In a test a dry cell, short-circuited, gave 25 amperes. One 20-pound storage cell, short-circuited, gave 550 amperes, producing 896 watts. Mr. Cooke showed that the interval resistance of the type of battery under discussion is very low. Heating is seldom reported.

On the question of trouble with self-starting apparatus in automobiles, Frank J. Stone said that damage came in connection with charging batteries, rather than in discharging. H. H. Smith, of the Edison Storage Battery Company, spoke on the subject of the Edison alkaline battery. He told of the factory in West Orange, N. J., as being quadrupled in capacity, to be ready for operation June 1. Mr. Smith explained the difference between the Edison and the lead battery, and said that the uninitiated should discriminate between acids and alkali in the making of electrolyte. Some Edison batteries have been destroyed by the use of acid. He claimed that gassing during charge wastes energy, but produces no harmful effect on the life of the battery. Mr. Smith described the action of Edison batteries under varying conditions of hot and cold weather, and said that such batteries are used at the present time in such extreme temperatures as those of the Philippines and Winnipeg.

R. E. Russell, of the General Electric Company, lectured on the process of charging storage batteries, showing views of apparatus used and the process.

Wireless Antenna on Church.

A complete wireless outfit has been installed in the Fifth Street Methodist Temple, Philadelphia, Pa., by the pastor, the antenna being mounted over the ridge-pole of the church roof. The antenna consists of four wires, each 65 feet long and 85 feet above the sidewalk. The question has been raised as to whether this apparatus is intended to communicate through the ether with the heavens above.

Telephone Train Dispatching.

The Chicago, Burlington & Quincy Railroad will extend its telephone train-dispatching circuits to the entire division between Burlington, Iowa, and St. Louis, Mo. The southern portion between Hannibal, Mo., and St. Louis is already equipped. The equipment of the 100 miles at the northern end will probably cost about $20,000.

Regulation of Public Utilities.

The regular monthly meeting of the Chicago Section of the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers was held on the evening of March 24 in the rooms of the latter society. The meeting was called to order by R. F. Schuchardt, chairman of the Electrical Section, who called upon the president of the Western Society, Albert Reichmann, to preside at the meeting.

The paper of the evening was by Harold Erickson, member of the Wisconsin Railroad Commission, and was entitled "The Regulation of Public Utilities in Wisconsin."

Mr. Erickson's paper opens with a brief review of governmental regulation, showing that this prevailed to some extent even in the time of ancient Rome. It was in the middle ages, however, that public control was developed along with the evolution of what has come to be known as the common law. During the past 50 years the rapid growth of public utilities has changed these from luxuries to actual necessities. In meeting the demand for these public services considerable abuse has crept in for which special laws and special commissions have recently been created in many states.

In Wisconsin the laws regulating railroads and other carriers were enacted in 1905. Two years later laws covering other public utilities were passed and the jurisdiction of the Wisconsin Railroad Commission extended over them. Of the manifold duties of this commission one of the first is the enforcement of adequate service. Since the services rendered by public utilities are now necessities, it is important that they shall be adequate and up to a reasonable standard. Sets of standards for electric light and gas utilities have been drawn up. In the case of electric service it is required that the voltage regulation shall be such that the maximum voltage shall not exceed the minimum by more than six per cent. Electric meters must be inspected at least once a year and tested at full, half and one-tenth load; an error of more than four per cent on any load is not permitted. The regulation of service is carried out through a corps of inspectors, each covering a particular district in the state. Mr. Erickson also explained the general system of inspection for gas, telephone, water and railway service. The net result of this work has been a very marked improvement in the heating value, pressure and purity of gas, the regularity of voltage of electric utilities, general improvement in telephone service and in the purity and pressure of water. Not only has the service been improved but in many cases deterioration of service has been prevented.

One of the largest fields of activity of the Commission is that relating to rates, on which the law states that rates must be reasonable and not discriminatory. They must be high enough so that the revenues obtained therefrom are sufficient to cover reasonable amounts for the operating expenses of a plant, including depreciation, interest and profit. The sum of the operating expenses and fixed charges is made the legal basis for rates. The first step in any rate-regulation problem is the determination of a fair value of the property upon which the investors are entitled to interest and profit. Careful analysis indicates that the cost of both the physical property and of obtaining business should be included in the appraisal, and that the original cost as well as the cost of reproduction of the physical property and of the business constitute evidences of value. The several classes of expenses must be apportioned among the various departments of service, particularly where different utilities are provided by the same company. Mr. Erickson explained in this connection the analysis of rate-making as carried out for a railway company.

One of the most important features of commission control is the requirement of uniform systems of accounting and reports. The Wisconsin law requires that every utility shall keep such uniform accounts and records and make such reports thereof as are required by the Commission. Classifications and forms of accounts have, therefore, been prepared for each type of utility. For the smaller companies they are more simple than for the larger ones. Careful checking and auditing of these records is necessary. The Wisconsin Commission receives about 1,100 reports of this character every year to audit, which requires a special corps of expert accountants. Much work has been done in aiding utilities in developing complete accounting systems adapted to their conditions. One of the most vexatious problems in this connection has been in the adjustment of reports of municipally owned utilities. It is the object of the law to require of these utilities similar reports to those made by the privately owned properties in order that they may be comparable with one another. The municipal reports, however, have usually been found far from complete and very much involved. Much study has, therefore, been given to the segregation of municipal utility accounts from the general city business.

Another important duty of the Wisconsin Commission is to supervise the issuance of securities and to control the capitalization of all utilities. About 150 applications for authority to issue stocks and bonds are considered each year. The idea of this capitalization control is to prevent the evils of overcapitalization, among which are that it makes the securities speculative rather than of an investment character and contributes to keeping the small local investor out of the public-utility field. This latter is unfortunate because it destroys the community of interest and harmonious relations between the utility and its customers. Another detriment of overcapitalization is that it involves unreasonable rates and frequently earnings which should be set apart for repairs and depreciation are paid out to security holders, so that the service of the plant naturally deteriorates. Unwise consolidation of public-utility plants frequently results when the right to issue securities is unlimited. All applications for the issuance of securities must be accompanied by detailed statements showing the purpose for which the issue is desired as well as statements of assets and liabilities and earnings and expenses of the plant. All these statements are closely scrutinized. The plants are also required to make subsequent reports upon how the security issues were exchanged or the proceeds therefrom expended.

Still another field in which the Commission has control is in the prevention of duplication and waste in the establishment and extension of both railway and municipal-utility plants. The public-utility laws of Wisconsin recognize that public-service utilities are naturally monopolies and the interests of the public are best conserved by protecting such monopolies and at the same time supervising and regulating them in the public interest. Therefore, competition among public-service companies in the establishment of new lines and plants is prohibited, except under such conditions as make it a benefit to the public. Before new lines are built or extensions made, a certificate must be obtained from the Commission stating that public convenience and necessity require such construction. In the case of municipal utilities the law has provided that all franchises are now indeterminate in duration and without the consent of the Commission no competing utility company is permitted to enter the territory served by a corporation operating under an indeterminate permit, but if the Commission finds that public convenience and necessity require such competition, a certificate may be issued to a new utility to enter the field. Mr. Erickson explained the basis of this requirement and showed the folly of providing duplicate wire lines for the same type of service along the same street, pointing out that in the telephone business particularly the existence of two companies is unwise unless physical connection between them is carried out.

In his conclusion the author showed that a public-service commission is charged with important duties of a highly technical character, which require that it should be taken entirely out of politics. Commission regulation provides an inexpensive and, for the most part, prompt remedy for the many grievances that are constantly arising between individuals or the public on the one hand and utilities on the other. The great majority of complaints are settled through correspondence or by informal conferences. The Commission acts as an advisory body to the utilities, particularly the smaller ones, who are glad to avail themselves of the engineering, statistical, accounting and other data collected and kept on file. The direct benefits of commission control have been very great to the public. These have been obtained without injustice to the utilities or their owners.

The discussion was opened by Bion J. Arnold, who pointed out that while Wisconsin was usually regarded as a radical state, the broadness and justice which had been exhibited by her Railroad Commission had set a standard for other states. He referred particularly to the control of capitalization and presented a scheme for eliminating over capitalization. This was to determine the present value of the util-

ity, including intangible values; out of the gross receipts allow fixed charges upon the total value; and use any surplus for an amortization fund, which shall be used to retire outstanding securities which represent intangible values, so that the capitalization shall be eventually reduced to equality with the physical value. This should be done without raising existing rates. After the outstanding securities have been reduced to equality with physical value any surplus should be utilized in improving service and labor conditions and should not go to either security holders or the municipality in the form of extra profits.

Edward W. Bemis pointed out that while Wisconsin was not the first state to have a public-utility commission, nevertheless its commission represented an epoch in the history of the subject on account of its attitude toward accounting, control of service, etc. He contrasted its attitude toward early losses of a utility with that of the Massachusetts Commission. The latter permits a higher rate of return to cover such a condition but does not permit the early losses to be capitalized. He raised the point of whether a surplus in the past operation should be treated from the same point of view as a deficit.

W. J. Norton contrasted the practice of the Wisconsin Commission in always looking issues squarely in the face with that of some of the other state commissions. He pointed out that the Wisconsin law requires any company to pay the expenses of the investigations when it is found that its rates are unreasonably high or unjustly discriminatory, and that although this clause had not been enforced by the Commission it had been copied in the statutes of other states.

Kempster B. Miller discussed the question of allowance for overhead charges, which he considered were usually underestimated. Except in the case of small properties, he knew of no instance where these expenses were as low as 12 per cent, the allowance usually permitted by the Wisconsin Commission. Such an amount is often eaten up by interest alone where the construction work is of long duration. He pointed out that engineers usually underestimated costs, especially with respect to hydroelectric properties. In such cases the overhead expense usually exceeds 25 per cent and he knew of one case under good management where it had amounted to 50 per cent.

Garrett T. Seely also spoke of overhead expenses and pointed out that an elevated railroad for instance might take as long as four years in construction, and a large part of its expense, such as for real estate, is incurred at the beginning. It is thus apparent that the overhead charges would exceed 25 per cent in this class of utility, and he thought that the allowance must vary a great deal with utilities of different kinds.

Harold Almert told of some experiences in other states. In one of these it was proposed to require in the utility act that allowance of only six per cent should be permitted as return on the present value of the plant, which should include only such property as is "used and useful" in the public service. He cited an example where a strict interpretation of this law would work an injustice. He also called attention to a provision in one state that no element of value should be allowed for water rights unless a similar sum had originally been paid to the Government for such rights. He considered it an unnecessary hardship upon a utility corporation to have the nature of its securities limited and considered it a sufficient safeguard if the total value of such securities was under control by the state commission. He thought the effect of such excessive restrictions upon future utility developments had not been sufficiently considered and would be found to be detrimental. He also pointed out the uncertainties in the position of utility companies owing to the possibilities of future radical legislation and changes in personnel of the commissions. Commissioners are often superseded in office just at the time when they have become sufficiently experienced in their duties to be useful.

William B. Jackson congratulated the state of Wisconsin upon the fact that her commissioners have not been superseded after becoming authorities upon the subject of regulation.

R. F. Schuchardt considered that the secret of the success of the Wisconsin Commission lay in the spirit of fairness which it had exhibited and to its basing its action upon the real facts in every case.

In answering to a number of questions which had been raised during the discussion, Mr. Erickson replied that the Commission now had entire control over the issue of securities and he considered that the scheme worked well. The rate of interest had been reduced on account of securities being safer than heretofore. When a utility is already overcapitalized the Commission can only insist that additional issues of securities do not exceed in value the new investments made. The law requires a fair relation between the values of stocks and bonds, and he personally considered it desirable that the management should be kept in the hands of local owners of a large proportion of securities.

In the case of municipal plants the control of service is in the hands of city councils, but the control of rates resides in the Commission. He had found that municipal plants were usually in greater need of regulation that those which are privately owned and the number of complaints was in the ratio of two to one. There is usually more discrimination and poorer accounting in the case of muinicipal plants and good management is a rare exception.

Regarding overhead expenses he said the usual allowance was 12 per cent in the case of small utilities and 15 per cent for larger ones. However, in valuing the property the unit costs used already involved a ten-per-cent allowance and if this were included the total allowance for overhead expenses might be placed at about 20 per cent or higher.

Rates were sometimes found to be too high and in other cases too low, and he considered both conditions objectionable. If the rates are too low the plant is allowed to run down and this has been quite generally true of small telephone companies especially.

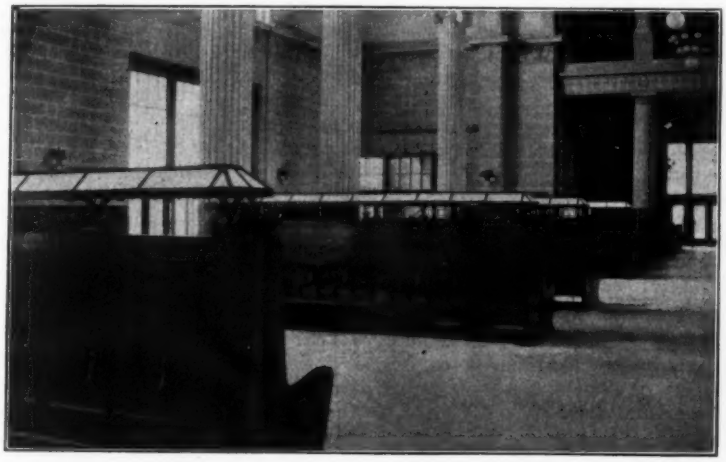
The Commission seldom assesses the cost of an investigation upon the utility company, as it is not always fair to do so. This section of the law had not been utilized to any great extent because it had not been found necessary. In many cases it is more a question of adjustment of rates than of general reduction, as the rates may be partly too high but also partly too low. Adequate service usually involves greater costs. Rate schedules were usually based upon a correct apportionment of the joint expenses of additional classes of customers. He considered it proper to take on additional classes of business at rates which would but slightly exceed the additional costs involved in such service, as the acquisition of such business would pay a portion of the joint costs, although it might not yield the average percentage on the total capital. New classifications were sometimes made for the express purpose of permitting the acquisition of new customers representing large amounts of business at rates less than those already scheduled.

No certificate of necessity has as yet been given to any competing utility, although three cases have arisen when it was only avoided at the last minute. In each of these cases it was a question of getting money to improve or extend the service in cases where the previous management of the utility had not been such as to invite the further investment of new capital.

A vote of thanks to Mr. Erickson was passed and the meeting adjourned.

Lighting Seats in a Waiting Room.

Until very recently poor lighting of railroad waiting rooms has been one of the greatest troubles of the delayed traveler, and in many cities of even large size the facilities for reading in such places are far below what is demanded by reasonable comfort. A new point of view on the part of railroad managers, however, is disclosed in the accompanying photograph of a seat-lighting installation in a station recently built in Houston, Tex. In this case, every seat is surmounted by an artistic canopy of translucent glass, under which is placed a horizontal row of 16-candle-power incandescent lamps. The inclination of the reflector throws the light downward at a pleasing angle upon the book or paper which the traveler may be reading, and one row of lamps answers for both sides of the seat bulkhead. The result is one of the most comfortable waiting places seen in four trips across the continent.



Method of Lighting Seats in Waiting Room.

Tungsten Lamp of High Efficiency.

The form of tungsten lamp which has been devised by M. Dussaud and designed by him as the "cold light," was the subject of a communication to the French Physical Society at its meeting on February 21.

M. Dussaud presented a series of experiments with the new lamp, which consists of a bulb containing a filament of tungsten wire wound in the form of a solenoid and occupying a very small volume. This filament is operated at a voltage very much higher than that corresponding to the normal operation of tungsten lamps, the current being interrupted at a rapid rate. This periodical interruption of the current makes it possible to operate the filament at overvoltage without danger of breaking or injuring the filament. Moreover, the vacuum in this lamp is pushed just as high as possible and the filament is prepared with the greatest possible homogeneity. The lamp is intended primarily for use in an optical apparatus, where it is necessary to generate a large flux of light in a limited volume, in other words to have high intrinsic brilliancy.

In a lamp giving 100 candles, operated at 16 volts and 1.5 amperes, the solenoid formed by the filament is approximately one millimeter in diameter and five millimeters long. For practical purposes it consequently constitutes a luminous point and all the light can be utilized in the optical system.

This new type of lamp is manufactured at Paris by a new process in a factory constructed especially for this purpose.

M. Dussaud demonstrated a lamp of 100 candlepower with alternating current supplied from a commercial transformer and also with direct current from a battery by means of an interrupter. The 24 watts necessary may also be produced without fatigue by means of a foot-operated magneto.

With the 100-candlepower lamp, M. Dussaud projected upon a screen at a distance of 30 feet the following, the size of the picture upon the screen being as indicated:

(1) A lithograph in colors covering an area 2.5 meters square.

(2) A postal card in colors covering an area 4 by 3 meters.

(3) A view of a moving-picture film covering an area 3 by 2.5 meters. To show the light is "cold" and without danger to the film, the latter was permitted to remain stationary in front of the film without catching fire. This absence of heat also prevents the deterioration of the colors of the films and slides prepared for the microscope.

This projection apparatus has been accepted by the French Minister of Public Instruction after examination by a government commission.

These lamps are made in sizes up to 5,000 candles, but always with an extremely small filament. With a lamp of 5,000 candles, the following apparatus was demonstrated: searchlight for a lighthouse having a power equal to that of the lighthouse at Biarritz; an apparatus for replacing magnesium in flashlight photography; an apparatus for optical telegraphy. A model was also exhibited of a searchlight projector which had been designed for the French War Department, and other types for other foreign governments.

In answer to questions which arose in the discussion following the presentation of his address, M. Dussaud stated that as regards volatilization his lamp was not different from other tungsten filaments, but the interruption of the current at the proper instant prevented the abrupt shock to the filament from the overvoltage and the gradual weakening of the filament, which may finally result in a short-circuit and the destruction of the life. He also discussed the question of the proper balancing of the cost of energy against the cost of the filament.

M. Riviere, inspector-general of the Lighthouse Service, stated that for lighthouse purposes it is desirable to have the intrinsic brightness of the source high, and it was in consequence of this that the electric arc has such superiority over other sources (100 candles per square centimeter as against 20 for the tungsten filament at ordinary voltages). He questioned the figure of 500 candles per square centimeter given by M. Dussaud for the tungsten filament at overvoltage.

With regard to the superiority of the electric arc to other sources, M. Dussaud replied that it is necessary in this question to consider the effect of atmospheric absorption. This increases rapidly as the wave-length diminishes, so that a source which is rich in blue rays may penetrate less for the same power than a source which is rich in yellow rays. The superiority of the electric arc over other sources may on this account be overbalanced in the cases of searchlights of long range.

Electric Strength of Ebonite.

Tests carried out at the British National Physical Laboratory show an electric strength for different specimens of ebonite varying from 68,000 to 150,000 volts per millimeter. The highest figures applied to ebonite made from Para rubber without adulterants. It is recommended that specifications require ebonite purporting to be of the highest grade to have an electric strength not less than 125,000 volts per millimeter.

PROTECTION OF WATER-WHEELS FROM DRIFT AND FLOATING DEBRIS.

By R. H. Pickens.

The following devices and methods are used for the protection of water-wheels against drift and floating debris: timber booms, steel booms and racks They will be considered in the order named.

Timber booms are made of large round or squared heart-pine timbers. There is a difference of opinion as to where round or squared timbers should be used, the general experience being that the round timbers give as good protection against drift as the squared, besides, they are slightly cheaper in first cost.

These timbers are securely joined together by means of heavily galvanized iron cable, or strips of iron bolted to the timbers.

The timber should be 16 inches square at the butt and 10 to 12 inches at the small end, or if round timbers are used they should be, after all of the sap wood is trimmed off, 14 to 16 inches at the butt and 10 to 12 inches at the small end; their length should be over 20 feet if possible, as the longer they are the fewer the joints and the better they serve their purpose. The large and small ends of the timbers are joined together; provision should be made for freeing one end of the boom when ice is running in order to prevent the breaking of the boom.

Steel booms are coming into extensive use, due largely to their inherent advantages and also because of the increasing price of timber. Steel booms are made up of short lengths, 8 to 15 feet, of heavily galvanized steel cylinders, electrically welded, very similar in appearance to the ordinary range boiler, having a diameter of 12 to 16 inches; these are joined together as in the timber booms. This makes a very durable boom, it is strong and buoyant and never waterlogs.

Racks are usually made of iron, of the softest and purest grades obtainable. It is important that the iron be pure in order to lessen corrosion.

The dimensions and spacing of the racks depend a great deal upon local conditions, the spacing should be such that there will be no loss of head due to insufficient opening in the rack surfaces. The racks should reach from the bottom of the channel to several feet above head water.

To prevent electrolysis of the racks, large pieces of zinc can be suspended in the water near the racks or touching the rack structure and electrically connected to the rack iron. This is only advisable where considerable trouble is experienced with corrosion or pitting of the iron.

In some localities wooden racks are used, but the practice is not extensive enough to warrant any special mention. One of the recommendations for wooden racks is that anchor ice is not so liable to form as it is where iron racks are used.

It has been advocated to use short lengths of racks, reaching just below the surface of the water, but the disadvantage of this arrangement is that water-logged debris will pass under the racks and cause trouble.

The spacing between the bars depends upon whether there are considerable quantities of twigs or whether the largest part of the debris consists of large pieces.

The racks are installed in sections consisting of from 10 to 30 pieces, bolted through with heavily galvanized iron bolts; the spacing is accomplished by using short pieces of pipe having an internal diameter large enough to enable them to be slipped over the bolts These pieces of pipe are cut to the length it is desired to space the rack bars.

Each section should be installed so that it is a separate unit and can be removed for repairs and replaced without disturbing any other sections.

The matter of installing double racks, rack-cleaning devices, etc., should be left to the discretion of the installing engineer who, it is needless to say, should be the most expert hydraulic engineer obtainable.

The Petroleum Industry in 1912.

There was no considerable change in the quantity of petroleum produced in the United States in 1912 compared with 1911.

As a rule, the eastern fields declined in production, because it was impossible to keep up the great output of 1911 without large additional discoveries of new pools in the older fields. The eastern decline was, however, offset by the increase in California, where the San Joaquin Valley fields are still at the height of the gusher stage.

An estimate of the production in 1912 and a comparison with the product in 1911 is given in Table I.

TABLE I.—PRODUCTION OF PETROLEUM IN THE UNITED STATES.
Barrels of 42 gallons.

State.	1911	1912
California	81,134,391	87,000,000
Oklahoma	56,069,637	52,000,000
Illinois	31,317,038	28,000,000
Louisiana	10,720,420	10,000,000
West Virginia	9,795,464	11,800,000
Texas	9,526,474	10,500,000
Ohio	8,817,112	8,500,000
Pennsylvania	8,248,158	8,000,000
Indiana	1,695,289	1,200,000
Kansas	1,278,819	1,300,000
New York	952,515	700,000
Kentucky	472,458	500,000
Colorado	226,926	200,000
Other States	194,690	500,000
	220,449,391	220,200,000

The total value of the product increased markedly, being about $150,000,000 compared with $134,144,752 in 1911.

In all the fields except those of California and the Gulf there was a steady drain on stocks during the year, so that from a total of 81,789,390 barrels—over a half year's output—on January 1, the stock declined to 69,000,000 barrels at the end of the year. This drain reflects the increased capacity of the refining plants of the United States, the greatly increased exports, and a gradual change in the general condition of the industry by which gasoline has become much more in demand, so that the trade is well satisfied with heavy grades of gasoline or naphtha. For this reason the dividing line between naphtha and kerosene has necessarily been drawn nearer to kerosene and a large quantity of oil has been distilled into the gasoline portion of the products and a less output of kerosene resulted. On the other hand, the heavy residues which are marketed as fuel oils have come into greater demand, and owing to the ever-evident effort to increase the yield of light products by splitting up these residues the supply of fuel oil has not kept up with the demand. The advent of internal-combustion engines, such as those of the Diesel type, promises still higher prices for fuel oils. The United States has been slow in the adoption of these new engines, but their general adoption abroad has pointed the way to rapid increase in their use here.

The general decline in production except in California would doubtless have been much greater but for the increases in prices. Prices advanced so greatly during the year as to stimulate drilling, even in the old New York and Pennsylvania pools, and so checked the decline. In the Appalachian field the great rise in price from $1.30 to $2 a barrel seems to have checked the normal decline and even to have effected an increase.

The prices of various oils at the beginning and end of 1912 are given in Table II.

TABLE II.—PRICES OF PETROLEUM IN THE UNITED STATES.

Kind of oil.	Price per Bbl. Beginning of 1912.	Price per Bbl. Close of 1912.
Pennsylvania grade	$1.30	$2.00
Cabell, Pa.	.94	1.60
Mercer, Pa., black	.87	1.53
Corning, Pa.	.77	1.53
North Lima, Ohio	.84	1.22
Indiana	.79	1.17
Princeton, Ind.	.67	1.05
Ragland, Ky.	.45	.65
Kansas and Oklahoma	.50	.80
Electra, Tex.	.53	.85
Caddo, La., heavy	.40	.60
Saratoga, Tex.	.65	.75
Spindletop, Tex.	.70	.80
Batson, Tex.	.65	.75
California:		
Coalinga, heavy	.30	.35
Kern Co., heavy	.30	.35
Santa Maria, h'vy.	.40	.40
Los Angeles, h'vy.	.70	.70
Fullerton and Whittier, heavy.	.70	.70
Canadian oil	1.24	1.59

Another feature tending to strengthen the position of oil in this country is the decrease in production in Russia.

LETTERS TO THE EDITOR.

Possibilities of the Society for Electrical Development.

To the Editor;

The newly formed Society for Electrical Development, whose organization was reported in your recent issue, is one of the most encouraging movements in the electric industry that has taken place for some time. From the personnel of its officers and membership it is obvious that great results will be obtained. Among the objects stated, that of the education of the public in the use of electricity for domestic and rural purposes is likely to prove of the greatest importance. It is of particular interest to me on account of the fact that I have in press a small volume intended for wide distribution among power distributors and users entitled "Electricity for the Farm and Home," and because I have since 1905 been advocating in a number of articles in the technical and general periodical press, the adoption of electricity for agricultural and domestic purposes. Being the author of "Hydroelectric Developments" and "Steam-Electric Power Plants," and having designed and installed numerous plants, I am in contact with all phases of the subject, and may therefore be pardoned for offering a few suggestions as to the most effective methods of progress in this direction.

Undoubtedly the most effective means of reaching the farmer is through the canvasser who goes from farm to farm and personally explains the advantages of what he is trying to sell. Such canvassers by utilizing electric automobiles could readily carry a small outfit of representative equipment, which, operated from the storage batteries carried, would afford the farmer and his wife a decisive object lesson on the advantages of electricity. Such a canvasser would also supply the farmer with comprehensive and handsomely illustrated literature to be considered at leisure.

Supplementing the canvasser's activities the central stations should have model showrooms fitted with all kinds of electrical apparatus, located within easy distances of farming communities, and at intervals special lectures could be given on the subject, to which the farmers should be invited. Such lectures should not be wholly for the purpose of selling the apparatus, but should be of an educational nature.

Manufacturers of isolated-plant equipment should follow the same course and should be able to advise the farmer what equipment to adopt for the power resource available, whether water, coal, gas, oil, gasoline or wind.

In order to promote the use of electricity on the farm, the farmer must be fairly dealt with and honestly served. The apparatus should be simple, convenient and reliable in operation. He should be supplied with the apparatus specially suited to his purposes and should not be misguided into taking standard equipment originally designed for other purposes, which will prove a handicap instead of an advantage.

Valuable lessons are to be learned from German practice, where electric farming has been carried on successfully on a wide scale for more than 15 years, using among other apparatus electric plows of from 40 to 100 horsepower in capacity, while the first furrow is yet to be turned by an electric plow in the United States. A leading feature of German agricultural electricity is the use of narrow-gauge field railways for removing crops to the barns, especially serviceable for large farms. Refrigerating and ice-making plants and by-product factories also augment German agricultural prosperity. Farming in Germany is conducted along the same lines as industrial and manufacturing undertakings and is just as much of a science. Competent engineers are employed and improvements are constantly being made.

It should be among the duties of the Society for Electrical Development and especially also of The National Electric Light Association to assist in bringing rural and domestic electricity in the United States to the high point of development attained in Germany, for not only will this redound to their own benefit and to that of the farmer, but will be of material assistance to the general public in the reduction of the cost of living. Indeed, the rapidly increasing use of electricity in agriculture is one of the most important developments now taking place in this country.

Electricity is undoubtedly the greatest agent of agricultural progress and the great emancipator of the toiler. A motor of even diminutive size does the work of a man at far less expense, while larger units economically supplant farm draft animals, whose consumption of farm produce is an enormous item. Thus in supplanting labor, electricity has a most profound effect upon agriculture, since agriculture demands a great amount of labor compared with the skill involved.

The great number of uses, however, to which electricity is put on the farm is surprising. In lighting, both arc and incandescent lamps are utilized; heating, cooking, ironing, and other results are accomplished; while the power uses of electricity are manifold, it being employed in almost every operation from plowing to the delivery of the finished product, including harvesting, lumbering, irrigation, laundering, dairy and domestic uses.

Electric farming provides for central-station concerns one of the best methods of establishing a good load-factor. It opens up an enormous market for new machinery and consequently works a new era in electrical industry.

FRANK KOESTER.

New York City.

Three-Wire Installation on Two-Wire Service.

To the Editor:

Referring to Question No. 218 in your Electrical Inspectors' Section, while I am not in the class that this matter is referred to, it seems to me that all of the replies that I have noted beg the question entirely.

For instance, it is common practice for many power companies to specify that services feeding connected loads of certain amounts shall be arranged for three-wire service. Owing to their line arrangement at the time that service is made it is possible that they have to arrange that two-wire feed be furnished. It is impractical to have a limit of 660 watts as the total on that service. This is commonly taken care of by requiring that the neutral shall be of double the capacity of the outside wires.

Again, the feeds from one main center to branches can not be limited to 660 watts even though the two-wire feed is used. This is another place where the double neutral would be used.

W. M. PRICE.

Seattle, Wash., March 17, 1913.

Electric Cooking Proves Highly Economical in England.

Some very interesting disclosures reflecting the economy of electricity for cooking and lighting are made by our contemporary *Electrical Engineering*, which says that some remarkable figures were produced at a recent fortnightly meeting of the Board of Guardians, Eton, England, in relation to the saving made in the use of electricity for electric cooking and electric lighting. When gas was used for lighting and cooking the total annual cost was $1,140, whereas since electricity has been installed for both these purposes the total cost has been reduced to $390, showing a total saving of no less than $745. The lighting and ventilation in all the buildings has improved very considerably. These figures represent to some extent the use of carbon lamps, so that a considerable further saving may be anticipated when the use of metal lamps becomes general.

BOOK REVIEWS.

"Design of Polyphase Generators and Motors." By Henry M. Hobart. New York: McGraw-Hill Book Company. Cloth, 265 pages (6x9 inches), illustrated. Supplied by the Electrical Review Publishing Company for $3.00.

Mr. Hobart's new book illustrates methods of designing by practical examples of calculation carried out in considerable detail, but in a clear and systematic manner. While it is largely a class textbook, experienced designers will find it an interesting means of comparing their methods with others. To practical designers taking up new lines of designs it will be of value; that is, a designer of continuous-current machines will find it of assistance in designing alternating-current generators or induction motors. Correspondence-school students and engineers having in charge induction motors and alternating-current generators will find it interesting to check the principal dimensions, magnetic fluxes, weights, performances and types of windings by means of the methods and data given. Induction-motor performances are analyzed by circle diagrams. The effects of a higher or lower frequency or voltage on the starting and pulling power, efficiency and power-factor of induction motors may be predicted. The performances and adaptability of induction motors of the squirrel-cage and slip-ring type and of synchronous motors for difference kinds of work are compared and the effect of synchronous motors in power-factor correction is calculated. A few of the most commonly used windings are clearly illustrated diagrammatically in colors. This book has a merit of using but one system of units throughout in all calculations, dimensions and data, and that is the metric system. The mechanical execution is good and the curves and tabulations are well arranged. Very complete references which are usually available in this country are given for those who may care to compare other methods of design with those of Mr. Hobart's, or to go more deeply into special details or extreme cases or proportions of design.

E. M. TINGLEY.

"The Mathematics of Applied Electricity." By Ernest H. Koch, Jr. New York: John Wiley & Sons. Cloth, 651 pages (5¼x7½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $3.00.

With the exception of an introductory chapter, which is equal in length to nearly one-fifth part of the whole book, the text is intended to follow a year's drill in the essentials of algebra, plane trigonometry and plane geometry, also in the elementary principles of mechanics, heat and electricity. The author tells us also in his preface that instruction from the mimeographed form of the text now before us has been conducted for a number of years, and has demonstrated its usefulness as a powerful and interesting presentation which has promoted the student's judgment, fidelity, poise, and other valuable qualities. One is bound to accept a statement of this nature in its entirety, notwithstanding that it tends to disarm criticism. "The proof of the pudding is in the eating," and since the eating of the mimeographed material has led to no internal disorders, it is natural to conclude that the pudding is digestible and good. This obviously simplifies the reviewer's task, and confines all adverse criticism to sins of omission. There is, however, another saying to the effect that enough is as good as a feast: the simplest diet, if abused, may be with difficulty assimilated. Given that the reader is no mathematician, is there not too much in this book that is mere food for babes? Thus, on page 186 we are told that the magnetic density in a circuit of cross-section 0.75 by 0.5 inch is 50,000 lines of force per square inch, and we are asked "how many lines of force thread the circuit." To be fair to the author, it should be stated that he claims to have so presented his material that each chapter may be read separately, irrespective of what may have preceded it. It is, however, questionable whether the attempt to bind, as it were, several distinct books together to produce one complete work is ever likely to be entirely successful.

The book represents a great amount of hard and conscientious work; but are there not some parts that might with advantage have been omitted, bearing in mind the purpose to be fulfilled? For instance, is it necessary for the electrical engineer to know anything about the many approximate graphical constructions for determining length of a circular arc (page 206)?

Chapter I is intended to meet the requirements of those engaged in various electrical industries, who find their progress retarded through want of familiarity with elementary practical mathematics. The plan or scheme which forms the groundwork of this chapter is not obvious, but this is of little moment if the desired goal is reached; there are, however, other and possibly shorter paths by which the same end can be gained. In regard to the sins of omission—Chapter XXVI, introducing the reader to the use of vectors, is none too long, and the following chapter, dealing with vector algebra, is entirely too short.

The author has collected and presented a very large number of useful and instructive problems, the solution of which will familiarize the student not only with the mathematical processes, but also with the essential elements of electrical engineeering. There is a slight inaccuracy in the working out of the problem on page 128 and in the "interpretation" on page 129. The average value of the electromotive force generated in the coil would be 2.16 volts, not 0.54 volt. A similar problem is correctly stated on page 193. There are some uncorrected printer's errors, generally obvious.

Part II, explaining the use of squared paper and the formulation of graphs, should be of great value to students and electrical engineers. Chapter XXIII, dealing in a simple manner with the differential and integral calculus, is also very well written. Part III deals entirely with the solution of alternating-current problems: it contains an excellent chapter on the circle diagram.

A. STILL.

"Steam Power Plants." By Henry C. Meyer. New York: McGraw-Hill Book Company. Cloth, 219 pages (5¾x9 inches), illustrated. Supplied by the Electrical Review Publishing Company for $2.00.

The purpose of this book, as set forth in the author's preface, is to serve engineers and others in charge of mills, factories or electric power stations, who are called upon to design or purchase a steam power plant or parts of it, when their knowledge of the machinery that goes into such a plant is more or less limited, and who are unable to obtain the benefit of the advice of a competent consulting engineer. The subject is treated in detail under chapters on Proportioning Steam Boilers; Design of Horizontal Return Tubular Boilers; Selection of Types of Engines; Specifications for Steam Engines; Turbines; Arrangement of Steam and Water Piping; Piping, Separators and Oiling Systems; Condensers and Pumps; Feed-Water Heaters and Economizers; Mechanical Draft; Chimneys; and Coal Handling, Water Supply and Purification. The various items are clearly presented and discussed and the book serves its intended purpose excellently with two exceptions. The chapter on Design of Horizontal Return Tubular Boilers is superfluous, because the various boiler inspection companies furnish standard designs and specifications for this type of boiler, which can be had for the asking, and because the design is a purely technical matter. To a less degree this applies to Chimneys.

Notably good features of the book are the assortment of plates showing arrangement and equipment of existing plants and the numerous diagrams and tabular information of performance.

G. W. BISSELL.

New Electrical and Mechanical Appliances

Large Direct-Current Turbogenerators for Cleveland Central Station.

In our issue of February 15, 1913, brief reference was made to the largest direct-current turbogenerators ever built, which are now installed in the Canal Road station of the Cleveland Electric Illuminating Company, Cleveland, Ohio. Further interesting data respecting these Westinghouse machines have now come to hand. These two machines are 3,750-kilowatt, 275-volt, 180-revolutions-per-minute, shunt-wound generators driven by steam turbines through Westinghouse reduction gears with a 10 to 1 ratio.

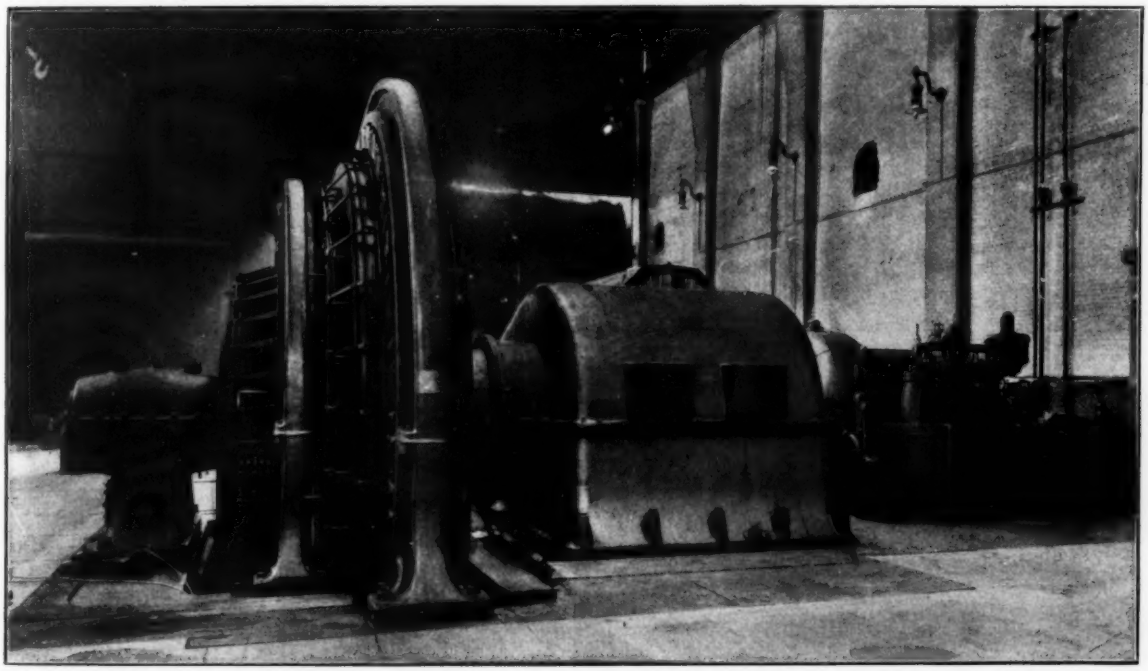


Fig. 1.—Westinghouse Direct-Current Generating Set Installed in Canal Road Station, Cleveland, O.

The photograph in Fig. 2, taken while the machines were on test in the factory, shows a workman of slightly above the average height in the foreground and gives some idea of the dimensions of the machines. Each of these generators, entirely exclusive of the turbine and reduction gear, occupied six carloads in shipment. The armature was shipped on a flat car with the platform removed. The winding of the armature extended down to within four inches of the ballast on the railroad track. A sheet steel plate three-eighths inch thick was placed beneath the armature to protect it from stones or any other projection on the roadbed. Even with the armature at this level, there was only one routing between East Pittsburgh, Pa., and Cleveland, O., where the clearance was sufficient to permit the armature to pass.

As it was impossible in the present state of the art to build a direct-current generator of this size for a high speed, use has been made of the reduction gear which has achieved such excellent reputation in marine work and is now being extensively used in connection with direct-current generators and steam turbines. The large gear of this speed-reducing mechanism shown in Fig. 3 is 100 inches in diameter and has 259 teeth. The pinion has 26 teeth, and the ratio of 26 to 259 gives the "hunting-tooth" feature, which has been recognized as desirable in the design of toothed gearing. The speed of this gear at the pitch line is approximately 54 miles an hour. At full rated load of the generator the gear transmits 5,350 brake horsepower and on several occasions during overloads it has carried 6,000 brake horsepower without giving any indications that its ultimate safe output had been reached.

The dynamometer feature of the floating-frame construction provides a check upon the accuracy of the electrical instruments that measure the generator output. In this station a considerable error in the calibration of the wattmeter was detected by comparing its readings with those of the power indicator on the floating frame.

These two machines will supply light and power for the business section of Cleveland. The Illuminating Company's system was originally a three-wire Edison system, but as the business increased alternating current was distributed to the outlying districts. The downtown congested business district, however, was never changed and is still fed from a three-wire Edison network. The company also furnishes steam heat to this district.

The power plant located on Canal Road on the banks of the Cuyahoga River, was a combination alternating-current-direct-current station. The direct-current part of the station consisted

of engine-driven generators aggregating in capacity about 8,000 kilowatts. The alternating-current end of the station consisted of about 22,000 kilowatts in turbogenerators.

Due to the rapid growth of the station and also to the fact that the condensing water obtained from the Cuyahoga River was exceedingly bad, the Illuminating Company selected a location at the foot of Seventy-first Street along the lake front, and a new alternatnig-current generating station, which will have an ultimate capacity of 200,000 kilowatts, was built. This new plant is located approximately four miles from the business center of the city. Obviously, it was not possible to abandon the Canal Road station entirely, due to the fact that steam heat had to be supplied. It was decided, therefore, to make the Canal Road station strictly a direct-current generating station, from which steam could be supplied, inasmuch as this station is only about two blocks from the center of the thickly populated business portion of the city.

After the removal of the alternating-current turbogenerators from the old station to the new station nothing was left but reciprocating engines to furnish steam to the heating system, and the maintenance cost and trouble encountered in running these engines against a back pressure became excessive. Some trouble was also experienced with oil getting into the heating system.

The question of new equipment then resolved itself into the selection of direct-current turbogenerators or alternating-current turbogenerators and rotary converters, in either case the turbines to run non-condensing so as to supply the necessary exhaust steam for heating. The direct-current outfit was found to be decidedly more efficient and was chosen. The size of the outfit was chosen rather from the standpoint of the amount of exhaust steam required than from the generator capacity necessary.

It is the intention of the Illuminating Company to run these generators only during the months in which the exhaust steam is required, the alternating-current station supplying the Edison system through rotaries at other times.

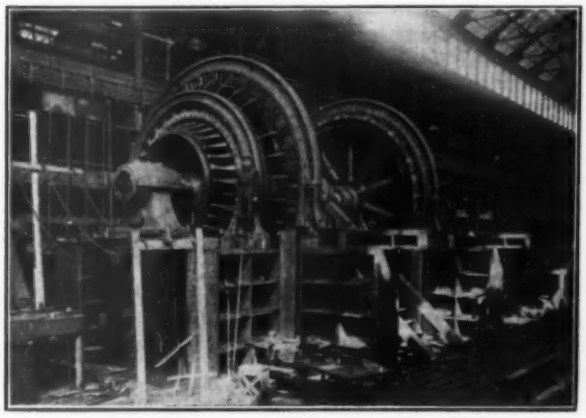


Fig. 2.—Generators on Test in Factory.

Fig. 3.—Pair of Large Gears for Reduction-Gear Set.

Crawford Cedar Yard at Menominee, Mich.

Another View in Cedar Yard.

The Crawford Cedar Company's Yards.

In the two lower illustrations are shown two views of the Crawford Cedar Company's yards, at Menominee, Mich. This company is among the larger of the pole-producing companies and although the pictures show only a partial view of the yards, they afford convincing evidence of the ability of the company to meet extraordinary demands for poles. The Crawford Company now has available more than 50,000 poles and many thousands of poles will be added in the next three months, as soon as the weather permits of the shipping of poles by water.

The Crawford Company's yards are excellently situated. The company has a trackage of over 2,000 feet, some of which runs through the yard from south to north. In the pole yard there are three tracks between the different piles of materials. Poles are handled by a traveling steam derrick, which is shown in the illustrations. The company's facilities for loading enable it to handle

about 15 cars per day. Five railroads are available in Menominee over which the company can ship its product. This arrangement enables it to secure cars promptly in spite of car shortage at many other points.

The Crawford Cedar Company has been supplying electric light and power telephone companies with cedar poles for many years and prides itself upon the reputation it has made for quick deliveries, excellent stock and reasonable prices. Manager Wm. S. Patch personally answers all inquiries promptly and his painstaking efforts have resulted in making the Crawford Company one of the best known in the cedar business.

Street Lighting at Farmer City, Illinois.

One of the most successful ornamental street lighting systems for a town of fair-sized population is that designed and installed by J. D. French, superintendent of water and light, through the Local Board of Improvement at Farmer City, Ill. The installation consists of 25 three-light Cutter posts and one five-light Cutter post. About 3,000 feet of steel-taped cable, manufactured by the Safety Insulated Wire & Cable Company, were used. Some of this was No. 8 and some No. 6 cable. The cable was laid in an open trench, no duct or other protection being used. The main feeders for the business district were removed from the main street so that there is no obstruction of any kind, the ornamental features being devoted entirely to the lighting standards. The lamps are all lighted until midnight after which the top lamps only remain lit.

The city has taken considerable pride in its street lighting system, which it considers satisfactory in every detail. The Local Board of Improvements and the mayor, John W. Kendall, and city clerk, David Mitchell, have received many letters of inquiry and several committees have visited the town from surrounding cities to look over the system. It is understood that based upon the satisfactory showing of the Farmer City installation a number of towns have closed contracts for a similar installation.

Street Lighting With Cutter Ornamental Tungsten-Cluster Posts at Farmer City.

Motor-Driven Meat-Slicers.

Motor-driven meat slicers are rapidly taking the place of the butcher's knife and hand-operated machines. In rapidity, cleanliness, convenience and economy, the motor-driven machine has no rival. The work of installation is very simple, and the cost of operation is only about one-half cent an hour for continuous operation. The saving in the clerk's time alone, it is stated, will pay for the motor in a very few months. With a hand-operated slicer, a great deal of the clerk's time is taken from his most important duty, that of waiting on the trade; whereas, by the use of motor drive, the work is done much quicker and the customers are given a decidedly improved service, something they quickly appreciate.

A small electric motor can very easily be belted to any rotary type of slicer. The motor, if desired, may be mounted on the floor, wall, or ceiling, or on a bracket. Motors specially adapted to this class of service are manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

THE FARMER AS A CONSUMER OF CENTRAL-STATION POWER.

By H. W. Young.[1]

An advantage which most central stations enjoy is a surrounding farming district which needs electric power. The general awakening of the country as a whole to the necessity of improved farming methods has been reflected in the central-station field by considerable activity on the part of many managers to devise ways and means of making the farmer a permanent consumer of current. The farmer quickly recognizes the advantages of electricity in the operation of motors for running various machines and when once electric power is adopted for a particular service, he soon wants to use current for many other purposes. He is a large buyer of power and always a good customer.

Aside from the economy secured in operating motor-driven machinery, convenience of electric lights in the building, yards, etc., the use of electricity on the farm makes for greater safety from fire. As farm buildings are usually a long distance from effective fire-fighting apparatus, this increased safety gained by the use of electricity for power and light as opposed to gas engines and oil is a vital reason for the adoption of electric service.

In addition to the demand for power on the farm, there are in every farming community certain industries which convert the farm products into finished products. These industries, while often

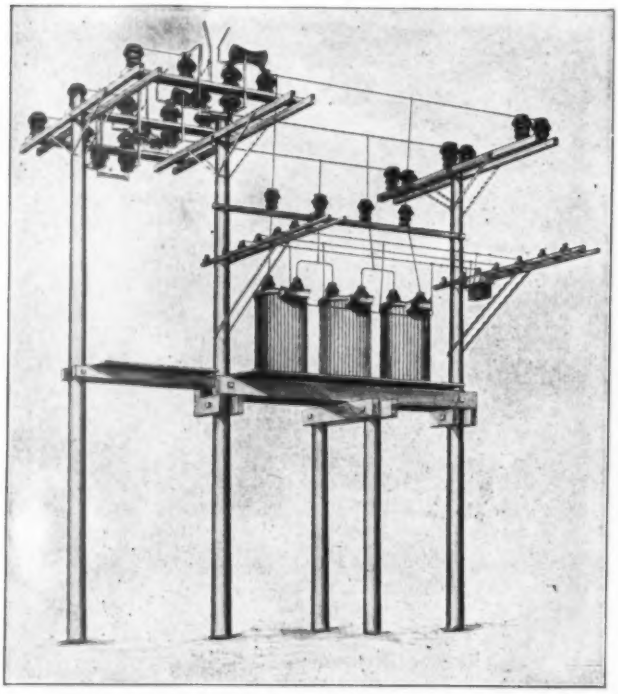
1 President, Delta-Star Electric Company, Chicago, Ill.

small, offer a good incentive to the central-station manager seeking rural distribution. Electricity by its inherent cleanliness and safety is especially attractive to owners of dairy farms or creameries. It can be used to drive cream separators, churns, refrigerating machines, milk testers, bottle washers, etc. To the dairyman refrigeration is an essential and electrically operated artificial refrigerating plants insure better sanitary conditions, greater convenience and lowest cost..

Scientific agriculture, irrigation and central-station electricity supply offers a combination of benefit to an entire community. It is well known that proper crop culture requires that lands be drained and water applied at the right time and in the right quantity. With electrically operated pumps, marsh lands can be drained, water applied to arid or high lands and by the proper application of water, crops suitable for each section can be made available by pumping and the central-station manager who cultivates these pumping loads is building up a good permanent source of income.

Rain may come when needed, it may come in a deluge, but with a well regulated irrigation system operated or governed by electric power intensive farming may be carried on with profit both to the farmer and the central station. Again, the introduction of an electric pumping installation in a given community will serve as an opening wedge in securing other new business. The central-station manager who fails to stimulate a general use of electricity in the rural districts by following a far-sighted policy as to extension of service lines will eventually find the field covered by small individual isolated plants or co-operative distributing stations owned by small groups of farmers. The farmer desires to use electricity and this want can be supplied at a low investment and maintenance cost by use of outdoor types of substations properly distributed over a given area.

A recent type of outdoor substation transforming from 33,000 volts to 2,200 is shown in the accompanying illustration. It will usually be found advisable to adopt the secondary potential of 2,200 volts and distribute in the usual manner, using small individual transformers to step down to 110, 220 or 440 volts. This permits the use of standard transformers, distribution lines, etc. When it is desired to distribute at three phase, 2,300/4,000 volts, the 2,200-volt transformer secondaries can be connected in star with grounded neutral. When the load is close to the substation it is perfectly feasible to distribute directly at 110, 220 or 440 volts, two or three wire. This eliminates the standard 2,200-volt transformers used with straight 2,200 volt or with 2,200/4,000-volt distribution outlined above.



Delta-Star Type A Substation, 33,000/2,200 Volts, 180 Kilowatt-Amperes.

As a rule it is advisable to limit the total capacity of the transformer to approximately 150 kilowatts when mounted on platforms. Above this capacity the transformer weights become too great for convenient handling and it is considered better practice to mount the transformers on platforms resting directly on the ground. Under these conditions the transformers should be surrounded by a fence, approximately 12 feet in height to prevent unauthorized persons tampering with the equipment. When it is necessary or desirable to mount transformers exceeding a total capacity of 150 kilowatts on the platform, it is good practice to strengthen the structure with bracing poles or stubs.

Vertical Motor for Cement Mills.

In order to provide a thoroughly satisfactory drive for vertical machinery (such as grinders and pulverizers) in cement mills and other places where the service is very severe, the Westinghouse Electric & Manufacturing Company has built a line of specially designed vertical motors in sizes varying from 75 to 200 horsepower for both direct and alternating-current circuits.

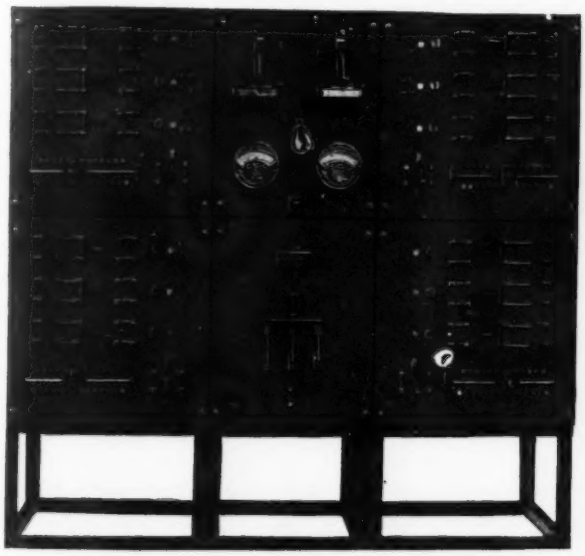
The special feature of this motor is its strong, rugged construction. The motor frame is supported by a massive cast-iron base, which rests on slide rails with belt-adjusting screws. The shaft is of very large proportions and the bearings are designed to withstand the severest stresses. The weight of the motor and the major part of the horizontal thrust due to belt tension are carried by a ball bearing mounted within the motor base. This bearing is housed in an iron case and can be easily removed if the necessity arises. The bearings are automatically oiled, the oil being forced between the bearing surfaces whenever the motor is in motion. The ball thrust bearing runs immersed in oil. The pulley is mounted inside the thrust bearing, which, together with the strength of the shaft and the rigid support afforded by the motor base, insures the elimination of distortion due to the belt tension so that the proper clearance is always maintained between stationary and rotating parts.

Vertical Motor for Cement Mills.

The commutation of direct-current motors is practically sparkless, so that brush renewals are rarely required and commutators are long lived.

Cutler-Hammer Charging Equipment for Electric Baggage Trucks.

The use of motor-driven trucks in factories, railroad stations and other places where baggage is handled has been found to be of considerable advantage. For the charging of the batteries of these trucks, the Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., has manufactured and installed a number of charging equipments, one of which is shown in the accompanying illustration. This is installed in the North Station, Boston, of the American Express Company, and is designed to charge from one to twelve of the twelve-cell trucks at one time. There are four charging-rheostat panels, two on each side of the center panel, and each of these is arranged for charging one truck alone, or two or three in series. The rheostats are of the slider type with resistance grids mounted in frames back of the panels. The double-throw switches, above the rheostat contacts, when thrown to the right connect the batteries of the two or three trucks in series, and when thrown to the left cut into the circuit a fixed block of resistance sufficient to absorb the line voltage above that of the battery at maximum current.



Charging Panels for Storage-Battery Trucks.

The arrangement for charging in groups allows the most economical use of current while at the same time keeping the number of separate rheostats to a minimum and the price consistently low. One truck can be charged alone if necessary, but it is usually possible to put two or three on charge at the same time.

The center panel carries two meters, the main switch, and single-pole circuit-breakers for each of the outside wires of the three-wire system on which this equipment is installed. In this particular case plug receptacles were placed on the panels with tell-tale lamps.

Commercial Electric Vehicles at Boston Show.

The commercial-vehicle section of the 1913 Boston Automobile Show was held in Mechanics Building, Boston, Mass., March 19 to 26. The display of trucks and service wagons was large, representing nearly all the important makes both of gasoline and electric motor vehicles.

The interest shown in the electrically propelled trucks indicated the growing popularity of this type of vehicle, and many inquiries and a satisfactory number of sales were reported by agents.

The display of accessories, including storage batteries, lighting and ignition system, etc., was almost identical with that of the pleasure-car section of the show, held the week previous, while the electric vehicles shown comprised the following:

General Vehicle Company, New York. This firm exhibited a two-ton chassis showing the motor in operation; a chassis for a five-ton truck; a one-ton industrial truck; a one-ton delivery wagon for transporting structural material; a one-tone emergency wagon built for the Fall River Electric Light Company; a butcher's wagon, the first storage-battery vehicle used for that purpose in New England. Edison, Exide and G-V batteries are used.

Eldridge Manufacturing Company, Boston, exhibited a five-ton front-drive brewery truck; a five-ton fire-brick truck; a five-ton coal cart (the sixth built for one Boston concern); a two-ton, four wheel-drive dumping coal cart for use in narrow alleys and limited areas in rear of office buildings, built so as to turn around on its own axis; a five-ton dumping contractor's wagon; and a four-wheel-drive lumber truck. The distinguishing feature of the Eldridge Company's product is the fact that the motor is contained in the wheel, the force of the motor being applied to a circular rack at the rim of the wheel at two opposite points by a pinion. It is claimed that the mechanical transmission efficiency exceeds 97 per cent. The rear wheels are high, shod with steel tires, the drive being within the front wheels, and the actual weight of the load resting in greater part on the rear wheels. The Eldridge trucks are hauling more coal in Greater Boston than all other trucks taken together, both gasoline and electric, it is said.

Atlantic Vehicle Company, New York, showed a five-ton chassis of the company's "long-distance truck," having low center of gravity.

Dodge Motor Vehicle Company, Cambridge, Mass. This concern exhibited a 2,000-pound paneled delivery wagon, with shaft drive.

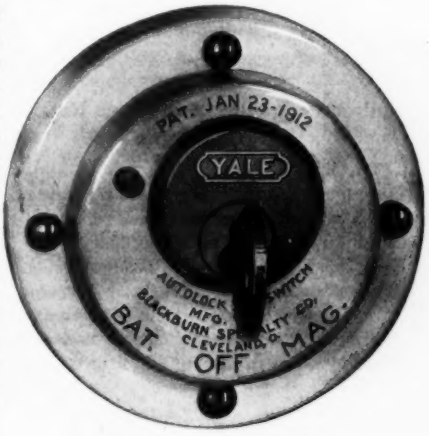
General Motor Truck Company, Boston, exhibited a two-ton express body and a 1,000-pound delivery truck.

Edison Electric Vehicle Company, Lawrence, Mass., showed a 1,000-pound and a 3,000-pound electric truck, propelled by worm drive.

Waverly Company, Indianapolis, exhibited a 3.5-ton chassis and a 1,000-pound chassis

The Blackburn Autolock Switch.

The theft of automobiles has created the demand for an absolutely reliable means of safeguarding the car in the absence of the owner or his authorized agent. Various locks have been applied to the control levers, valves, etc., secret switches have been inserted in the ignition circuit, and other means tried with more or less success. A very simple but thoroughly reliable automatic lock switch has therefore been developed by the Blackburn Specialty Company, 1120 Prospect Avenue, Cleveland, Ohio, to meet this urgent demand.



Automatic Lock Switch.

The view of this device shown herewith is slightly less than actual size. As shown, this lock switch has been designed particularly to control the ignition circuit of gasoline cars. It is mounted on the dash or on the face of the coil box, preferably the latter, in which case it takes the place of the ordinary ignition switch. The device consists of a Yale lock, practically the

only key lock that cannot be picked by skeleton keys, and a good switch controlled thereby. As shown, a turn to the left closes the battery ignition circuit, a turn to the right the magneto circuit. The key can only be withdrawn when the circuit is open or off, in other words, when the key is withdrawn the engine cannot be started. The switch cannot be short-circuited because the circuit through the coil must be complete in order to be effective for ignition and in no way can it pass through the coil unless the switch bar is properly turned by the key. The switch case cannot be removed even by taking out the four screws, unless the key is first inserted and turned to the releasing point.

The Autolock switch can be used with any system of ignition beside the one indicated. The switch connections can be arranged so that they will specially fit any type of coil or ignition outfit. Moreover, although specially designed to control ignition circuits, these lock switches are readily adapted for absolutely safeguarding almost any electrical circuit where it is desirable to lock the circuit against closing or opening.

Indirect Lighting in a Large Retail Clothing Store.

The firm of Henry C. Lytton & Sons conducts the largest retail men's clothing and furnishing store in Chicago; it is appropriately known as "The Hub." The rapid growth of its business made the old quarters at State and Jackson Streets entirely inadequate and therefore within the last year a new 18-story building was erected for the firm on the opposite corner. The new structure was completed and occupied a few weeks ago. The Hub establishment occupies the nine lower floors and also the basement and two sub-basements; the upper portion of the building is leased to various tenants.

Throughout the new store every effort was made to provide for the convenience and comfort both of customers and employees. In the selection of every part of the equipment the question of its harmonizing with the most up to date ideas of merchandising was given important consideration. Before deciding on the lighting equipment to be employed a number of tests and trial installations were made of different systems, including direct, semi-indirect and pure indirect fixtures. The final decision was to use indirect lighting in practically all parts of the establishment. This makes the installation probably the largest retail store equipped for indirect illumination.

The view in Fig. 1 gives a partial idea of the imposing design of the main floor of the store. With its lofty, bright and ornate ceiling, massive columns and continuous mezzanine balcony, it gives an impression of a display room in which one wishes to tarry and examine all that may be seen. The design of the decorative scheme and of the lighting equipment is so subdued, however, as not to monopolize attention; on the contrary since substantially no direct light is visible, interest is quickly concentrated on the attractive display of goods.

Fig. 1.—View of Main Floor of The Hub.

The illumination throughout this large floor is exceptionally well diffused. This effect is obtained by the general illumination from 16 illuminated-bowl indirect fixtures each hung at the center of a bay; these bays are 22 feet 6 inches square and the fixtures are hung so that the upper edge of the bowl is 42 inches from the ceiling, which is 20 feet 6 inches above the floor. In the illuminating engineering calculations it was determined to employ 2.4 watts per square foot for these fixtures, this to give about six foot-candles on the show-case level. In Fig. 2 is shown a partial cross-section of one of these main fixtures. Mounted on each of the eight radial arms is a 150-watt tungsten lamp directly above an opaque mirrored-glass reflector; this equipment furnishes the indirect lighting. To secure the pleasing and highly desirable effect of a luminous bowl, 60-watt lamp is screwed into the bottom of the central stem. The bowl is of a whitish, marbleized, diffusing glass, known by the trade name Marbleite, which harmonizes with the prevailing colors used in the decorations. The bowl is not quite as bright as the ceiling. The metal parts of the fixture harmonize with the silvery metal finish employed throughout the main floor.

At each of the corners of the balcony or mezzanine floor there are carried up from the railing two illuminated-bowl indirect-lighting standards. Each contains a 400-watt lamp set in a mirror reflector which is open at the base so as to allow some light to strike a diffuser and be projected from it to the Marbleite glass bowl. The shoe department on the south and east sides of the mezzanine floor is illuminated by 16 pure indirect pedestals each 6 feet 11 inches high; each has a 250-watt lamp. On the west side of this floor and beneath the balcony on the main floor

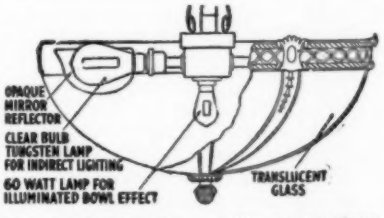

OPAQUE MIRROR REFLECTOR
CLEAR BULB TUNGSTEN LAMP FOR INDIRECT LIGHTING
60 WATT LAMP FOR ILLUMINATED BOWL EFFECT
TRANSLUCENT GLASS

Fig. 2.—Construction of Illuminated-Bowl Indirect Fixture.

there are 54 simple indirect pendent fixtures each containing a 150-watt lamp. On the tables there are also a number of Curtis portables.

The basement, which is unusually high and is devoted to the sporting-goods department, has pure indirect illumination with composition-bowl fixtures, as shown in Fig. 3. The second to the seventh floors, inclusive are de-

voted to the mens' and boys' clothing departments; each floor varies from 15 to 13 feet in height and is provided with indirect illumination through composition-bowl fixtures such as shown in Fig. 4. About 600 indirect fixtures are used in the main basement and the six floors just referred to; each contains a also a few purely ornamental low-wattage lamps on the main floor. The general offices, employees' rest and lunch rooms on the eighth floor are provided with semi-indirect lighting through short ceiling stems at the base of which is an inverted opal-glas reflector.

Fig. 3.—Basement Sales Room, The Hub.

Fig. 4.—Typical Clothing Floor, The Hub.

250-watt lamp. About two watts per square foot was allowed.

For the show windows on the State and Jackson Street sides, for numerous show cases and wall cases in all departments of the store and for fitting mirrors direct lighting with mirror-glass reflectors is employed. There are

The architects of the building are Marshall & Fox. The lighting of the nine merchandising floors was laid out by the illuminating engineering department of the National X-Ray Reflector Company, which furnished all of the mirrored-glass reflectors for the pure indirect, illuminated-bowl indirect and the direct show-window, show-case and other fixtures. The fixtures for the first and mezzanine floors were furnished by the Acme Metal Manufacturing Company and for the other floors by the Decorators' Supply Company.

Sudan Glass Reflector, a New Holophane Product.

The Holophane Works of General Electric Company, Cleveland, O., has just placed on the market a new product designated as "Sudan Glass Reflectors in Panelex Design." Sudan glass is new in chemical composition, of very delicate amber tint, when lighted, and translucent. Its smooth surface is said to be ideal for lighting service, for though its finish is practically dust-resisting there is no polish or glare. Specks, spots and other flaws have been entirely eliminated.

The Panelex design of reflector is just as new as the Sudan glass. This new style of reflector is without marked ribs or hollows that would catch and hold dust, and the lamp filament is hidden from the ordinary line of vision. Sudan glass in the practical Panelex design is said to demonstrate to a new degree large possibilities of light diffusion and redirection without loss of artistic worth. The reflectors are made in both the bowl and shallow types, and are particularly desirable for use in office buildings, retail stores, and some rooms of residences.

Western Electric 1913 Fans.

The pressed-steel fan brought out last year by the Western Electric Company met with such marked approval and covered the field so thoroughly that it was not found necessary to make any changes in design for the approaching season.

A few additional types have been made, however, chief among which are the 8-inch induction type and the 16-inch residence type fans. The former was added to meet a demand for this type of fan. It is made for 50 and 60-cycle frequencies from 100-110, 111-120 and 200-230 volts and is furnished in the regular standard finishes to which has been added a new white nickel finish in which the 8-inch series fans are also furnished.

A complete new line of 16-inch residence fans has been added for operation on standard voltages and from 25 to 30, 40 and 50-cycle frequencies. The 12-inch residence line of fans has been extended to include these frequencies and standard voltages.

The 32-inch ceiling fans have also been extended to include 25-30, 40 and 50-cycle frequencies, thus placing the Western Electric Company in a position to offer a full line of small-size alternating-current ceiling fans.

One standard finish (black enamel) has been adopted for all desk and bracket type fans.

Latest Approved Fittings

ATTACHMENT PLUGS, Fuseless.—Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill.

"Benjamin" 3 amperes, 250 volts, with outlet bushing or cap holding cord without use of knot.

Catalog No. 903A, with rotating screw shell, for use with asbestos cord.

Catalog No. 903C, with rotating screw shell and insulated set screw.

Catalog No. 903E, with nine-thirty-seconds-inch opening in bushing.

Catalog No. 906, with separable cap.

Catalog No. 907, solid attachment plug without rotating sleeve feature.

Approved February 24, 1913.

ATTACHMENT PLUGS. — The Bryant Electric Company, Bridgeport, Conn.

"New Wrinkle" Attachment Plugs.

Catalog No. 462, with key socket, 250 watts, 250 volts.

Catalog No. 463, with pull socket, 250 watts, 250 volts.

Catalog No. 464, with switch rosette,

"Dan-Dee" Cabinet.—Erie Art Metal Company.

1 ampere, 250 volts; 3 amperes, 125 volts.

Approved February 6, 1913.

CABINETS.—Erie Art Metal Company, Erie, Pa.

"Dan-Dee" sheet-metal cabinets.

Approved January 29, 1913.

CIRCUIT - BREAKERS. — Sundh Electric Company, 115 Cedar Street, New York, N. Y.

150-ampere, 600-volt, direct-current, air-break type, with magnetic blowout coil.

Approved January 29, 1913.

FIXTURES.—W. B. Catlett Electric Company, Richmond, Va.

Two, three and four-light straight electric and combination fixtures.

One and two-light portables.

Approved February 10, 1913.

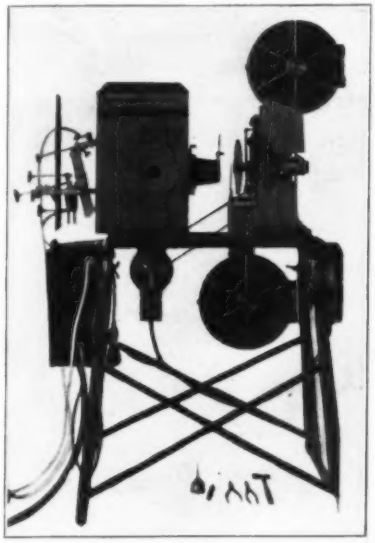
The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

GROUND CLAMPS.—George Heinemann & Company, Girard Avenue and Fifth Street, Philadelphia, Pa.

"Six in One" Ground Clamp.

A copper band provided with a bolt and nut for drawing it together and securing a grip on conduit pipe. Provided with a groove for soldered connections to ground wire. Nos. 1, 2 and 3 for pipes from three-eighths to three inches in diameter.

Approved February 10, 1913.



"Kinemacolor" Moving-Picture Machine.—Kinemacolor Company of America.

INDICATING ELECTRIC DOOR OPENER AND SIGNAL.—H. M. Huehsch, 5109 South Ashland Avenue, Chicago, Ill.

This device is a combination of an electric bell, speaking-tube mouthpiece, push-button and signal light, mounted on a face plate, with the mechanism inclosed in a sheet-steel box; 10 volts.

Approved February 3, 1913.

PICTURE MACHINES AND APPLIANCES.—The Kinemacolor Company of America, 1600 Broadway, New York, N. Y.

"Kinemacolor" motor-driven moving-picture machines; current rating 90 amperes. The motors supplied by the Kinemacolor Company of America are as follows and are expressly approved for use with these machines:

Direct-current motors, General Electric Company; ¼ horsepower, 110 volts. Robbins & Meyers, "Standard"; 1/5 horsepower, 110 volts.

Alternating-current motor, Kimble Electric Company; 1/5 horsepower, 110 volts, 60 cycles.

Approved February 3, 1913.

MOTION-PICTURE MACHINE.—Great Northern Manufacturing Company, 22-23 Triangle Building, Rochester, N. Y.

A knife mechanism attachment for use on motion-picture machines, to cut the film and close the film magazine openings, through the burning of an inflammable link when the exposed film takes fire.

Approved December 14, 1912.

MOTION-PICTURE MACHINE.—The Enterprise Optical Manufacturing Company, 564-572 West Randolph Street, Chicago, Ill.

"Motiograph" Model 1-A, two types; one for hand operation, the other driven by special motor supplied by the

"Six in One" Ground Clamp.—George Heinemann & Company.

Enterprise Optical Manufacturing Company, as part of the equipment.

Approved January 7, 1913.

RECEPTACLES, Weatherproof.—Federal Electric Company, Lake and Desplaines Streets, Chicago, Ill., for Federal Sign System (Electric), sole agents, Chicago, Ill.

"Federal" spring-clamp type.

Sign, catalog Nos. 319, 320.

Approved February 3, 1913.

SWITCHES, Automatic.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

"Palmer" Safety Limit Stop; Bulletin 5910.

Interrupted Gear Limit Switch; Bulletin 5911.

Crane Protecting Panel; Bulletin 5925.

Solenoid-Operated switches; Bulletins 6400, 6405, 6406, 9580, 9581.

Approved January 15, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

CASHMERE, WASH.—The Council has passed a resolution for installing a lighting system. O.

KYLE, TEX.—J. W. Tompkins and associates will install an electric light and power plant here. D.

BEAUMONT, CAL.—The Southern Sierra Power Company has been granted a fifty-year franchise here.

WORCESTER, MASS.—It has been voted to extend the street lighting system on South Street as far as the town farm.

HUNTINGTON BEACH, CAL.—Bids will be received until April 7 for the installation of a municipal lighting system.

MALVERN, O.—The Malvern Electric Light & Power Company has been incorporated with a capital stock of $10,000 by R. H. Hayes.

GLENS FALLS, N. Y.—It is proposed to appropriate $3,500 for the purpose of installing a municipal lighting system in this place.

BALTIMORE, MD.—The Metropolitan Electric Lighting Company has been incorporated for $10,000 by William E. Duncanson, Baltimore. N.

TIMPSON, TEX.—The Timpson Light & Power Company will install a complete system of street lighting here and make improvements to its plant.

BAKERSFIELD, CAL.—Bids will be received until April 10 for the installation of an electric-light system for the Ransburg public-highway lighting district.

CINCINNATI, O.—It has been announced here that the Union Gas & Electric Companies will build a $4,000,000 new electric generating station in this city.

WESTCHESTER, PA.—The Wayne Electric Light Company has increased its capital stock to $20,000, the proceeds to be used for extensions and improvements.

RUSHVILLE, IND.—It is reported that the I. & C. Light & Power Company, of this town, will supply power for lighting to St. Paul and several other small places.

SAN ANTONIO, TEX.—The San Antonio Gas & Electric Company will spend about $100,000 in extending its gas mains and adding improvements to its electric lighting system here. D.

NEWPORT, ORE.—The Yaquina Electric Company will enlarge its plant at Newport and install machinery to the extent of $3,500. A 150-horsepower boiler is among the improvements.

TULARE, CAL.—The Tulare County Power Company is making arrangements to increase the capacity of its plant in this city and for the extension of its pole lines in the southern part of the county.

CONCORD, MASS.—This town is considering the purchase of a 500-kilowatt turbine unit and condenser for installation in connection with its municipal lighting plant, at a cost estimated at about $12,000. W.

ST. LOUIS, MO.—American Light & Power Company has been incorporated with a capital stock of $10,000. W. W. McCurdy, A. E. Reinhard, C. P. Reinhard, Lottie M. McCurdy are the incorporators.

SPRINGFIELD, ILL.—The Springfield Light & Power Company has submitted a street lighting proposition, in competition with the municipal electric plant. The City Commission ordered the proposition placed on file.

FREEHOLD, N. J.—The Board of Public Utility Commissioners has granted permission to the Monmouth Lighting Company to issue bonds for $14,000, and $2,500 in emergency notes, to provide for business extensions.

NEWARK, N. J.—The Roseville Business Men's & Citizens' Improvement Association is negotiating with the Public Service Electric Company for the installation of improved electric street lights in the Roseville section. A.

SPRINGFIELD, ORE.—The Oregon Electric Railway Company is receiving bids for the transportation of camp supplies and equipment for the construction of a power plant on the headwaters of the McKenzie River near this city. O.

IRVINGTON, N. J.—The Town Council has authorized its Water and Lighting Committee to obtain estimates of cost and necessary data in connection with the proposed establishment of a municipal electric-lighting and water plant. A.

PORTLAND, ORE.—The Portland Gas & Coke Company, the Pacific Power & Light Company and the Walla Walla Railway Company, Guy W. Talbot, president, plans the expenditure of $3,000,000 in improving and extending the different facilities. O.

HILLSBORO, ORE.—A movement is now on foot to install cluster lamps in the business district of this city. Business men have expressed their willingness and it is believed the business portions of Second, Third and Main Streets will be equipped shortly. O.

WICHITA FALLS, TEX.—The Wichita Falls Light Company is preparing to extend the street lighting system of this city. It has entered into a ten-year contract with the City Council for the establishment and maintenance of a street lighting system. D.

SAN BERNARDINO, CAL.—It is stated that there is a strong probability that the Southern Sierras Power Company will enter the Imperial Valley field with its lines. It is estimated that $1,000,000 will be spent by the company this year in extensions of its line in this part of the state.

CLINTON, IOWA.—At a special election on March 18 the Clinton Gas & Electric Company was granted a new 25-year franchise. This insures the construction of extensive improvements involving an expenditure of about $100,000. Twenty-three new arc lamps will be installed in the business district.

SAN FRANCISCO, CAL.—The Great Western Power Company has been granted authority to issue bonds in the sum of $4,411,000, the proceeds to be used for the general improvement, extension and development of the company's facilities, especially the completion of the dam on the Feather River.

BEVERLY, N. J.—The Public Service Electric Company is planning for the rebuilding and reconstruction of its lines throughout Beverly and vicinity. The Beverly City Council has adopted a resolution requesting the company to install an underground conduit system for its lines in making such change.

PORTLAND, ORE.—An ordinance is being prepared for presentation to the City Council, providing that the Portland Railway, Light & Power Company shall establish a down-town terminal station for all of its lines from which they shall radiate instead of using the public streets as terminals.

VANCOUVER, B. C.—The British Columbia Electric Company has plans under way for three transformer-station buildings; two in Hastings and one near Sapperton. These structures will be of steel frame and reinforced concrete construction, two stories in height, and will cost about $450,000.

SAN FRANCISCO, CAL.—The City Electric Company has been granted permission to extend its service conduits on Market, Larkin and Howard Streets, on condition that the city have the right to take over such conduits at any time on paying their value and complying with other prescribed regulations.

JAMESBURG, N. J.—The electric-lighting plant of the Jamesburg Electric Light & Water Company was destroyed by fire with a loss estimated at about $10,000. It is understood that the plant will be rebuilt. Merritt Pharo is president of the company, and Frederick Greenslade, local superintendent. A.

ALBANY, ORE.—The cluster system of street lighting was endorsed at a recent meeting of the City Council and it is almost assured this system will be established in the city within a few months. Plans and estimates of the cost of installation have been made by Louis C. Kelsey, consulting engineer, Portland, Ore. O.

HARRISBURG, PA.—L. S. Munroe, L. C. Lamb and W. B. Crawford have applied for Pennsylvania charters for

Lower Burrell Township Electric Company, Franklin-Westmoreland Electric Company, Penn Township Electric Company, Export Borough Electric Company and Upper Burrell Township Electric Company. N.

CAMBRIDGE, MASS.—Plans for a central light, heat and power plant for the buildings of Harvard University are advanced. The cost is estimated at about $50,000, of which $10,000 is for wiring the buildings for electric lights. It is proposed to run the machine shops and printing plant with energy generated by the plant. A substantial saving over present costs is claimed for the plan. W.

HARRISBURG, PA.—Seventeen electric companies, 11 for Westmoreland County, and six for Butler, with $5,000 capital stock each, were chartered on March 17, and are as follows: Westmoreland-Allegheny, Arnold, Hempfield, Irwin, North Irwin, Lower Burrell, Trafford and Pintar, New Hensington, Neptune, Translucent, Parnassus-Butler, Cranberry, Centre, Chocroa, Fairview, Oakland and Parker Electric Companies.

MORRISTOWN, N. J.—The Morris & Somerset Electric Company will install an electric street-lighting system at Mt. Tabor, in accordance with a contract received from the Camp Meeting Association, which operates this resort. The system will comprise a series circuit with 40-watt tungsten lamps. The company is now building an addition to its electric power plant near Mt. Tabor. A.

VICTORIA, B. C.—The Canadian Northern Pacific Railway, through T. J. Holt, the executive head of the road in British Columbia, has applied for permission to take 150 cubic feet of water from the Nicolum River near Hope, B. C., for the purpose of developing hydroelectric power. The company also plans the construction of a power plant near Yale which will be able to develop 50,000 horsepower.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company has been awarded the contract for supplying electricity for light and power for the Exposition. The work of installation will commence at once, the service to extend through the period of construction and during the exposition. The company will construct a generating station on the exposition grounds, which will be an auxiliary to the big plant at Patrero.

HELENA, MONT.—Sealed bids will be received at the office of the City Clerk until April 7 for the installation and construction of an ornamental lighting system in Special Improvement District No. 69, in accordance with the specifications and plans. Bids must be accompanied by a certified check in the sum of ten per cent of the total amount of bid, drawn to the order of the City of Helena, Mont. Proposals should be marked "Proposals for Improvement District No. 69," and addressed to J. A. Mattson, city clerk.

PITTSBURGH, PA.—Applications will be made for Pennsylvania State charters for 31 electric service companies in Allegheny County by C. E. Theobald, H. C. Seidel and G. R. Speer, this city. The intended corporations are named according to the borough or township in which they are situated and are all located in towns adjacent to Pittsburgh. They comprise the Green Tree, Upper St. Clair, Bridgeville, Heidelberg, Neville, Kilbuck, Ben Avon, Emsworth, Avalon, Scott, Ross, Knoxville, Union, Dormont, Carnegie, Chartiers, Crafton, Thornburg, Ingram, McKees Rocks, Kennedy, Coraopolis, West View, Bellevue, Bethel, Snowden, Baldwin, Carrick, St. Clair, Lower St. Clair, and Mt. Oliver. The companies will supply light, heat and power. N.

OROVILLE, WASH.—L. L. Work, president of Similkameen Power Company, will receive bids until May 15 for the purchase of the hydroelectric plant and other property of the Similkameen Power Company, located on the Similkameen River in Okanogan County, about four miles from Oroville; said property consists of water appropriations, power plant, buildings, machinery, concrete work, water ways and tunnel, transmission lines, transformers, tools, fixtures, wire, supplies, franchises and contracts (except accounts due and owing to the company). Detailed information regarding the property and present and prospective employment of electric current given on application, said power to be sold for cash. Certified check or bank draft for $2,500 must accompany all bids.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

LAMBERT, OKLA.—Lambert Rural Telephone Company has been incorporated by J. A. Eaton, J. C. Bell and J. W. Mercer, all of Lambert.

STROUDSBURG, PA. — Hunters Range Telephone Company has been incorporated with a capital of $5,000 by J. M. Mack, Allentown, Pa.

PASADENA, CAL. — The Home Telephone Company has announced its intention of expending $50,000 on improvements to its system in this city.

SPOKANE, WASH.—The Inland Independent Telephone Company has increased its capital stock from $15,000 to $50,000 to cover the cost of extensions.

KILLEEN, TEX.—The Rural Telephone Company has been incorporated with a capital stock of $3,000 by W. H. Walker, H. C. Smith and W. E. Spivey.

POMONA, CAL.—The Pomona Valley Telephone & Telegraph Union has been granted permission to issue $100,000 worth of bonds, the proceeds to be used for extensions.

HASTINGS, NEB.—The Nebraska Telephone Company is preparing to install complete new operating equipment in the new building which the company has under construction.

FORTVILLE, IND.—John Bird Telephone Company has been incorporated with a capital stock of $300. The directors are Charles Springer, Everett Ogle and John Stokes.

GLOUCESTER CITY, N. J.—The Delaware & Atlantic Telegraph & Telephone Company has been granted permission to extend its underground conduit system at this place.

AVOCA, WIS.—The Avoca & Muscoda Farmers' Mutual Telephone Company has been incorporated with a capital stock of $450 by H. Bock, W. Fessell and Henry Fleming.

SALEM, IND.—Farmers' Telephone Company has been incorporated with a capital stock of $1,000 to operate telephone lines. O. Q. Trueblood, W. Z. Voyles and H. W. Barkett are named as the incorporators.

CUMBERLAND, MD.—Telephones are expected to be installed for dispatching trains over the Maryland Division of the Western Maryland Railway between Cumberland and Hagerstown, a distance of 86 miles.

VANCOUVER, WASH.—Lacey-Chambers Prairie Mutual Telephone Company has been incorporated with a capital stock of $25,000. John E. Andrews and Frank J. Wendlick are named as the incorporators.

LA GRANDE, ORE.—The City Council has granted a franchise to the Eastern Oregon Co-Operative Telephone Company for entrance into the city. It is reported work of constructing lines will be started shortly. O.

BURLINGTON, N. J.—The Delaware & Atlantic Telegraph & Telephone Company is planning for the construction of new telephone trunk lines in this district, to consist of a total of approximately 62 miles of copper wire. A.

TRUE, W. VA.—Bluestone Mutual Telephone Company has been incorporated with a capital stock of $2,500. The incorporators are A. H. Mann, W. W. Martin, of Jumping Branch; E. B. Neeley, J. L. Martin and T. J. Winn, of True.

HARRISBURG, ARK.—The Southwestern Telephone Company has decided to rebuild its entire telephone system in this town, putting in all new cedar poles, cables on the principal streets and a metallic circuit. George Winters is manager here. Work is scheduled to commence at once.

INDIANAPOLIS, IND.—Farmers Telephone Company of Washington County has been incorporated with a capital stock of $1,000 to establish and operate a telephone system in Washington County. The directors of the campany are Oliver Q. Trueblood, Newton L. Voyles, Louis N. Smith, Jr., Hiram Barrett and Charles Lukenbill.

LEXINGTON, KY.—The Fayette Fiscal Court recently adopted a resolution ordering the Fayette Home Telephone Company to remove its poles and wires from the turnpikes of Fayette County before November 15. In the same resolution, County Judge J. Percy Scott, of Lexington, is authorized to offer for sale a county telephone franchise at a price not below $500. G.

TRENTON, N. J.—Architect John T. Windrim, Philadelphia, is preparing plans for a new central telephone exchange building to be erected by the Delaware & Atlantic Telegraph & Telephone Company. A switchboard with 10,000 lines capacity will be installed. The structure, including complete equipment, is estimated to cost about $250,000. C. R. Fairchild is district manager.

PORTLAND, ORE.—A. L. Barbur, city auditor, will receive bids until April 24 for furnishing the fire department of the city of Portland with 50 positive non-interfering successive fire-alarm telegraph boxes, according to plans and specifications on file in the office of the superintendent of the fire alarm and police telegraph, City Hall. Check for 10 per cent of the aggregate proposal payable to the order of the mayor of this city required. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

YORK, PA.—The York Railway Company is said to be considering an extension of its line.

GALVESTON, TEX.—The Galveston Electric Company will extend its street railway lines in various parts of the city. D.

COTTAGE GROVE, ORE.—From an authentic source comes the information that the Oregon Electric Railway will immediately extend its line to this city. O.

SALMA, KANS.—The street car company of this city is preparing for some vast improvements during the coming summer, principally in the extension of its lines.

STOCKTON, CAL.—It is announced that the Stockton Electric Railroad Company will commence work next month on the North Ophir Street line which will connect with the Main Street line.

SAN ANTONIO, TEX.—The San Antonio Traction Company will double-track several of its lines and make other improvements to its street railway system here at a cost of about $200,000. D.

TEMPLE, TEX.—B. F. Beverly, of Temple, and associates have taken steps to construct an interurban electric railway between Temple and Austin via Belton and Georgetown. The proposed line will be about 75 miles long. D.

EVANSVILLE, IND.—On April 15 the Evansville & Southern Indiana Traction Company will commence the construction of divisions which it will extend to Chrisney and Lynnville, Ind., for operation before the first of January, 1914.

LEWISTON, IDAHO.—The Lewiston-Clarkston Valley Railway Company has been incorporated with a capital stock of $1,000,000, by F. L. Sturm, C. F. Osners, L. L. Alford, J. E. Nickerson, Dr. Morris, J. E. Hoober and E. S. Florence.

LOUISVILLE, KY.—The Louisville Railway Company is contemplating the construction of an extension of its Brook Street line, a distance of five squares, from Oak to Hill streets, connecting at the latter point with the Second Street line. G.

BEAVER FALLS, PA.—It is reported that the Beaver River Power Company, recently incorporated for $300,000, proposes to build an electric railroad from Beaver Falls to Castorland, and ultimately continue this line to Carthage, and possibly Watertown.

PORTLAND, ORE.—The old steam line of the Southern Pacific Railway on the west side of the Willamette River will be electrified at once by the Portland, Eugene & Eastern Railway. Paul Lebenbaum, electrical engineer of the company, will have charge of the work.

PETALUMA, CAL.—The Petaluma & Santa Rosa Railway Company has applied for permission to issue $80,000 in bonds and $64,000 in notes, the proceeds to be used for an extension from Liberty station to a new station to be called Two Rocks, five and a half miles west.

PHILADELPHIA, PA.—The directors of the Pennsylvania Railroad have voted to establish an electric system for suburban passenger train service on the main line between Philadelphia and Paoli, a distance of 20 miles. This will cause an expenditure of about $4,000,000.

PORTLAND, ORE.—The Portland Railway, Light & Power Company recently filed its acceptance of the franchise granted by the Council calling for the construction of 18 miles of line. Actual work of construction will be started at once and will be completed in 90 days. O.

FORT WORTH, TEX.—The stockholders of the North Texas Traction Company have authorized an increase of $650,000 to the capital stock. The company is arranging to double track its line between Fort Worth and Dallas and to make other important improvements. D.

SAN LORENZO, CAL.—There is an agitation to build a broad gauge track on the San Francisco-Oakland terminal railways to San Lorenzo, on which electric cars will be run direct from Oakland. The proposed extension of the San Lorenzo line to Mount Eden will follow in due course.

CLINTON, IOWA.—The Clinton Street Railway Company was awarded a franchise for 25 years at the municipal election on March 18. This insures the building of extensions to the outlying portions of the city and the substitution of iron poles for wooden ones in the business districts.

DOVER, N. J.—The Morris County Traction Company is planning for the construction of a line from Morris Plains to Dickerson Bridge, at the eastern boundary of Dover, a distance of approximately 8 miles, and to connect with its present system near such point. Surveys for the line over the mountain are now being made. A.

PADUCAH, KY.—A franchise to enter Graves County with electric railways has been purchased for the sum of $125 by the Kentucky Southwestern Electric Railway, Light & Power Company. Construction of lines totaling 55 miles in length from Paducah to Murray, Mayfield, Fancy Farm and other neighboring cities will be commenced in the spring. G.

VICTORIA, B. C.—The British Columbia Electric Railway has decided to construct an electric line to tap the Fernwood district and the Work estate, according to an announcement recently made by A. T. Gollard, local manager of the traction company. The new line will connect with the Pandora Street track at Quadra Street, proceeding along Quandra Street to Bay Street, thence along Bay to Shelburn Street. Storage tracks will also be constructed. R. H. Sperling is general manager of the company. O.

SEATTLE, WASH.—E. M. Mills, representing Peabody, Houghteling & Company, holding the bonds of the Seattle, Renton & Southern Street Railway Company, is authority for the statement that street-railway extensions and betterments in the Rainier Valley to be made during the next three years will cost approximately $450,000, in the event the firm is successful in obtaining control of the property at a receiver's sale, which it is expected will be ordered within a month. Work an the extensions is due to begin May 1. O.

PROPOSALS.

ELECTRIC WORK.—Sealed proposals will be received by the Quartermaster, Washington Barracks, Washington, D. C., until April 7 for construction complete, including plumbing and electric work, etc., of addition to post bakery. For further information apply to the Quartermaster, Washington Barracks.

NEW INCORPORATIONS.

CLEVELAND, OKLA.—The Cleveland Electric Company has been incorporated with a capital stock of $15,000. The incorporators are W. P. Chapple, H. D. Bennett and J. R. Chapple.

BOSTON, MASS.—A charter has been granted to Bellows Falls Electric Company, having a capital stock of $150,000. Newell C. Young, Archibald R. Grantstein, and Fenimore P. Hill are the incorporators. W.

BOSTON, MASS.—Fall Mountain Electric Company has been incorporated with a capital stock of $125,000 by Newell C. Young, Archibald R. Granstein, and Fenimore P. Hill.

DECATUR, ILL.—Star Electric Company has been incorporated with a capital stock of $3,000 to do a general electrical and electric light business. The incorporators are Richard B. Hall, James A. Doodale and Daisy M. Clifford.

COLUMBUS, O.—The Electric Sales Company has been incorporated with a capital stock of $10,000 to deal in electrical supplies. The incorporators are C. L. Jeffries, R. L. Jeffries, H. W. McCleery, S. S. Jeffries and H. W. Culbertson.

CHICAGO, ILL.—R. C. Bierdemann Company has been incorporated with a capital stock of $7,500 to manufacture and deal in electrical machinery, appliances, etc. The incorporators are R. C. Bierdemann, Christian Meier and Paul C. Meier.

INDIANAPOLIS, IND.—Industrial Lighting Equipment Company has been incorporated with a capital stock of $10,000 to manufacture electrical appliances. The directors are Felix Devere, Flora M. Devere, Claude Shaw and Anna Shaw.

CHICAGO, ILL.—Crane Electric Specialty Company has been incorporated with a capital stock of $1,000 for the purpose of manufacturing electrical specialties. The incorporators are George Nelson, Henry Jampolis and Frank R. Crane, Jr.

INDIANAPOLIS, IND.—The Pumpelly Battery Company has been incorporated with a capital stock of $20,000 to manufacture and assemble electrical apparatus. The directors are Harry Murphy, Sidney W. Elston and James K. Pumpelly.

TROY, O.—The Hobart Manufacturing Company, has been incorporated with a capital stock of $1,600,000 to succeed The Hobart Electric Manufacturing Company. H. L. Johnston, W. E. Bowyer, E. E. Edgar are named among the incorporators.

CHICAGO, ILL.—Chicago Electric Time Switch Company has been incorporated with a capital stock of $2,500 to do a general manufacturing and merchandising business. The incorporators are Israel S. Berkman, Leo J. Neeson and Jay H. Brown.

FINANCIAL NOTES.

Stockholders of the American Light & Traction Company voted to increase the common stock from $15,000,000 to $40,000,000.

At the annual meeting of the Electric Storage Battery Company, John R. Williams was elected a director in place of George D. Widener, deceased. Other directors were re-elected.

Stockholders of the Northern Texas Electric Company have received notice of their right to subscribe to $650,000 of the common stock of the company at par. Each share of stock of record of March 7 carries with it one "right," and ten of these "rights" are necessary to secure one share of the new stock, payment for which is to be made April 11.

Western Canada Power directors have approved of plans for the further financing of the company's affairs. The necessary money, amounting to $3,200,000, has been supplied by New York interests. The new financing, it is understood, will be done through the medium of a debenture issue by a company incorporated under a Federal charter as the Western Canada Public Utilities, Limited, with a capital of $3,000,000. Debentures will be issued by this company against second mortgage bonds and treasury stock of the Western Canada Power Company, the proceeds to be devoted to the extensions which the Western Canada Power plans to make in connection with the B. C. Electric contract. When the extensions have been completed the second mortgage bonds will be redeemed and the $2,000,000 treasury stock returned to the Western Canada Power Company.

The New York Public Service Commission has approved the mortgage of $300,000,000 of the Interborough Rapid Transit Company, and the immediate issuance thereunder of bonds amounting to $160,957,000, par value. This amount of bonds will yield $150,494,895, at 93.5. These bonds are to be issued at once, for defraying the cost of construction and equipment imposed upon the Interborough Rapid Transit Company under its operating contract for the dual systems of subways. The Public Service Commission has also approved a mortgage of $100,000,000 on the assets, properties, lease holds, etc., of the New York Municipal Railways Corporation, and an immediate issuance of $40,000,000 in bonds under the mortgage.

At a meeting of the directors of the Lehigh Valley Transit Company there was a formal consolidation of all its subsidiary lighting companies. They will hereafter be components of a new company, to be known as the Lehigh Valley Light & Power Company, which was organized with a capital of $1,000,000. The constituent companies merged are the Allentown Electric Light & Power Company, the Halcyon Electric Light & Power Company, of South Bethlehem and the Whitehall, Emaus, Slatington, Hanover, South Allentown, Salisbury, Fountain Hill, Northampton Heights and Saucon companies. The object of the consolidation was to facilitate operation.

The amalgamation of the Frederick Railroad Company, Frederick Gas & Electric Company, Myersville & Catoctin Railway Company, Hagerstown Railway Company, Hagerstown & Boonsboro Railroad Company, Hagerstown & Myersville Railroad Company, Hagerstown & Northern and the Frederick & Hagerstown Powerhouse Company, has been ratified. The new company will be known as the Hagerstown & Frederick Railroad Company and will be capitalized as follows: Common stock, $2,000,000; preferred stock, $1,000,000, and first mortgage sinking fund, $10,000,000.

Dividends.

American Power & Light Company; a quarterly preferred dividend of 1.5 per cent, payable April 1 to stock of record March 24.

American Telephone & Telegraph Company; a quarterly dividend of $2 per share, payable April 15 to stock of record March 31.

Bell Telephone Company of Canada; a quarterly dividend to two per cent, payable April 15 to stock of record March 25.

California Electric Generating Company; initial quarterly dividend of 1.5 per cent on the preferred, payable April 1 to stock of record March 20.

Cincinnati & Hamilton Traction Company; a quarterly preferred dividend of 1.25 per cent and a common dividend of one per cent, both payable April 1 to stock of record March 20.

Continental Gas & Electric Company; regular quarterly dividend of 1.5 per cent on the preferred stock, payable April 1 to stock of record March 25.

Detroit Edison Company; regular quarterly dividend of 1.75 per cent, payable April 15.

Demerara Electric Company, Limited; a quarterly dividend of 1.25 per cent, payable April 1 to stock of record March 21.

Electric Storage Battery Company; quarterly dividends of one per cent on both common and preferred stocks, payable April 1 to stock of record March 24.

Fonda, Johnstown & Gloversville Railroad Company; quarterly dividend of 1.5 per cent, on the preferred stock, payable March 15 to stock of record March 15.

Metropolitan West Side Elevated; quarterly dividend of 1.25 per cent on the preferred stock, payable March 31.

Michigan State Telephone Company; regular quarterly dividends of 1.5 per cent on both common and preferred, payable March 31, to stock of record March 21.

New Orleans Railway & Light Company; a dividend of 1.25 per cent on the preferred, payable April 1 to stock of record March 17.

Pacific Telephone & Telegraph Company; the regular quarterly dividend of 1.5 per cent on the preferred stock, payable April 15.

Porto Rico Railways Company, Limited; a quarterly common dividend of one per cent, and a preferred dividend of 1.75 per cent, both payable April 1 to stock of record March 20.

Public Service Corporation of New Jersey; the regular quarterly dividend of 1.5 per cent payable March 31, to stockholders of record March 27.

Republic Railway & Light Company; a quarterly preferred dividend of 1.5 per cent, payable April 15 to stock of record March 31.

Southside Elevated Company; a dividend of 1.5 per cent, payable March 31 to stock of record March 20.

Trinidad Electric Company, Limited; a quarterly dividend of 1.25 per cent, payable April 10 to stock of record March 31.

United Utilities Company; 1.75 per cent on the preferred stock, payable April 1 to stock of record March 22.

Winnipeg Electric Company; a quarterly dividend of three per cent, payable April 2.

Reports of Earnings.

NORTH AMERICAN COMPANY.

The North American Company has issued its report for the year ended December 31, 1912. The income account compares as follows:

	1912	1911
Total receipts	$2,344,470	$2,105,993
Rent, taxes, etc.	213,243	249,127
Undivided profits	*2,131,227	1,856,866
Dividends	1,489,665	1,489,665
Surplus	641,562	367,201

*Equal to 7.15 per cent earned on $29,793,300 capital stock as compared with 6.23 per cent earned on the same stock previous year.

WISCONSIN EDISON COMPANY.

The consolidated income account of the companies controlled by the Wisconsin Edison Company (Milwaukee Electric Railway & Light, Milwaukee Light, Heat & Traction, Wisconsin Gas & Electric, and others), for the year ended December 31, 1912, compares as follows:

	1912	1911
Gross revenue	$7,781,349	$6,907,383
Operating expenses, taxes, and reserve	5,283,570	4,699,918
Net reserve	2,497,779	2,207,465
Interest charges	1,507,575	1,379,239
Balance	990,204	828,226
Preferred dividend	275,500	270,000
Surplus	714,704	558,226

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Mar. 24	Mar. 17
American Tel. & Tel. (New York)	131¼	132½
Commonwealth Edison (Chicago)	140	140
Edison Electric Illuminating (Boston)	276	277
Electric Storage Battery common (Philadelphia)	50¾	52
Electric Storage Battery preferred (Philadelphia)	50¾	52
General Electric (New York)	136½	138
Kings County Electric (New York)	129	129
Manhattan Transit (New York)	1¾	1¾
Massachusetts Electric common (Boston)	16½	16½
Massachusetts Electric preferred (Boston)	74	75¼
National Carbon common (Chicago)	115½	115½
National Carbon preferred (Chicago)	115	114
New England Telephone (Boston)	144	149½
Philadelphia Electric (Philadelphia)	22⅝	23¾
Postal Telegraph and Cables common (New York)	80	79
Postal Telegraph and Cables preferred (New York)	65	67
Western Union (New York) (ex-dividend)	65½	66½
Westinghouse common (New York)	62	67¼
Westinghouse preferred (New York)	117	118

*Last price quoted.

ELECTRIC STORAGE BATTERY COMPANY.

The report of the Electric Storage Battery Company for the year ended December 31, 1912, shows net earnings of $1,023,835, a decrease of $2,912,. The income account compares as follows:

	1912	Increase
*Gross sales	$1,536,190	$ 56,736
Operating expenses	512,355	59,648
Net earnings	$1,023.835	†$ 2,912
Other income	101,444	†135,417
Total income	$1,125.279	†$138,329
Dividends	649,964	.....
Surplus	$ 475,315	†$138,329
Previous surplus	3,318,080	613,514
Total surplus	$3,793,395	$475,215
Adjustments, including depr. U. S. Motor Co. securities	937,970	937,871
Final surplus	$2,855.425	†$462,656

*Less cost of manufacture and purchase and all expenses incident thereto.
†Decrease.

Monthly Earnings Statements.

KINGS COUNTY ELECTRIC LIGHT & POWER.

	1913	1912
February gross	$ 477,334	$447.070
Net after tax depreciation	195.313	178,995
Other income	5,665	5,042
Total income	200,978	184,037
Surplus after charges	117,441	111,386
Two months gross	1,006,937	946,047
Other income	10,343	10,138
Net after taxes and depreciation	415.268	397,280
Total income	425,611	407,418
Surplus after charges	261,275	262,247

COMMONWEALTH POWER, RAILWAY & LIGHT COMPANY.

	1913	1912
February gross	$ 549,665	$ 488,859
February net	286,337	203,473
February surplus	112,250	95,238
Two months gross	1,167,770	1,024,765
Two months net	598,944	437,082
Two months surplus	255,601	213,190

For the 12 months ended February 28, 1913, gross earnings were $6,532,924 and surplus for the common stock $851,-461, or 7.1 per cent on the outstanding issue of $12,000,000.

PHILADELPHIA RAPID TRANSIT.

	1913	1912
February gross	$ 1,775,158	$ 1,725,408
February net	670,617	600,872
Deficit after charges	96,887	138,569
Eight months gross	15,703,349	14,878,288
Eight months net	6,283,903	5,732,453
Surplus after charges	186,476	*177,634

*Deficit.

SOUTHERN CALIFORNIA EDISON COMPANY.

January	1913	1912
Gross	$397.103	$356,406
Net	187,497	185,043
Surplus	120,479	122,647
Preferred dividends	16,667	16,667
Balance for common stock	103,812	105,980

UNION RAILWAY, GAS & ELECTRIC COMPANY.

	1913	1912
February gross	$383,131	$293,554
Net	180,032	116,000
Surplus	71,215	65,564
Two months gross	802,891	607,276
Net	374,091	244,737
Two months surplus	160,298	113,590

SAN JOAQUIN LIGHT & POWER COMPANY.

January Gross	$142,175	$108,573
Net	89,436	62,294
Surplus	50,417	24,230
Six months gross	786,445	575,938
Net	501,837	305,843
Surplus	269,591	89,933

AMERICAN PUBLIC UTILITIES.

February gross	$ 210,529	$181,200
February net	99,358	73,093
Five months gross	1,075,045	948,076
Five months net	535,524	465,360

MT. WHITNEY POWER & ELECTRIC COMPANY.

February:	1913	1912
Gross	$39,103	$34,026
Net	22,294	19,359

PERSONAL MENTION.

HENRY L. DOHERTY sailed for London last week on the *Kaiser Wilhelm II* on a business trip to London.

M. C. BEEBE, professor of Electrical Engineering, University of Wisconsin, is the author of an article entitled "The Broadening Field of the Engineer," in "The Wisconsin Alumni Magazine" for February.

H. F. PORTER, plant superintendent of the Philadelphia Bell Telephone Company, was tendered a testimonial dinner on March 20 at the Continental Hotel, on the occasion of his being transferred to Harrisburg. Covers were laid for 75, and Felton Taggart was the toastmaster.

M. LUCKIESH, of the engineering department of the National Electric Lamp Association, delivered a lecture and demonstration entitled "Light and Art" before the Philadelphia Section of the Illuminating Engineering Society, at the Pennsylvania Academy of Fine Arts on Friday evening, March 28.

CHRISTIAN DANTSIZEN is the author of an interesting article describing the research laboratory of the General Electric Company, its development and the nature of the work carried on there, in the March issue of the *Journal of the Worcester Polytechnic Institute.* Mr. Dantsizen is a graduate of the Worcester Polytechnic Institute, class of 1910.

WILLIAM R. WILCOX, the retiring chairman on the Public Service Commission of the First District, New York, was presented last week with a handsomely framed and engrossed set of resolutions by members of the Commission, conveying to him their best wishes for his future success, as well as their tribute to his faithful work in connection with the Commission.

PAUL T. PAYNE, who has been associated with the Dearborn Chemical Company for many years, and who has for the past 10 years been engaged in various capacities in the sales department of the company, has lately been appointed district sales manager, with headquarters at the Indianapolis office of the company. Mr. Payne will direct the sales of the several company branches in that district.

A. T. MACDONALD, sales manager of the Louisville Lighting Company, of Louisville, Ky., is expecting an especial treat in May upon the occasion of the annual banquet of the Louisville Advertisers' Club, of which he is a leading member. Mr. Macdonald is one of a committee of three which has succeeded in securing the attendance and promised speeches of Elbert Hubbard and E. St. Elmo Lewis, two famous advertising experts, for the coming events.

C. A. GOODNOW, assistant to the president of the Chicago, Milwaukee & Puget Sound, arrived in Seattle recently for a conference with H. B. Earling, vice-president, with offices in Seattle. F. H. Shepherd, a representative of the Westinghouse Electric & Manufacturing Company, which it is understood, will furnish much of the equipment for the proposed electrification of the Chicago, Milwaukee & Puget Sound from Avery, Mont., to Harlowton, Mont., accompanied him.

OBITUARY.

JAMES BROWN, active head of the James Brown Manufacturing Company, Pittsburgh, Pa., died last week at Pittsburgh. Mr. Brown was 53 years old and had been in the electrical business for 30 years.

NEW PUBLICATION.

COAL SAMPLING.—Large users of coal will be interested in Bureau of Mines Bulletin No. 63, "Sampling of Coal Deliveries, and Types of Government Specifications for the Purchase of Coal," which has just been issued. The Federal Government, which purchases $8,000,000 worth of coal annually, buys more than half of it under specifications and has gone deeply into the question of sampling and analyzing coal. George S. Pope is the author of the bulletin.

DATES AHEAD.

American Electrotechnical Society. Spring meeting, Hotel Traymore, Atlantic City, N. J., April 3-5.

National Supply and Machinery Dealers' Association, the Southern Supply and Machinery Dealers' Association and the American Supply and Machinery Manufacturers' Association. Joint convention, Indianapolis, Ind., April 10-12.

Tri-State Water and Light Association. Annual Convention, Charlotte, N. C., April 15-16.

American Institute of Electrical Engineers. Pittsburgh, Pa., April 18-19.

Mississippi Electric Association. Annual convention, Natchez, Miss., April 21-23.

Iowa Electrical Association. Annual convention, Waterloo, Iowa, April 23-24.

Iowa Street and Interurban Railway Association. Annual convention, Waterloo, Iowa, April 23-25.

American Physical Society. Spring meeting, Washington, D. C., April 25-26.

Oklahoma Electric Light, Railway and Gas Association. Annual convention, Oklahoma City, May 6-8.

The Society for Electrical Development, Incorporated. Annual meeting, New York, N. Y., May 13.

National Fire Protection Association. Annual meeting, New York, N. Y., May 13-15.

Association of Railway Telegraph Superintendents. Annual meeting, St. Louis, Mo., May 20.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 21-24.

Electrical Supply Jobbers' Association. Spring meeting, Chicago, Ill., May 26-28.

National District Heating Association. Fifth annual convention, Indianapolis, Ind., May 27-29.

National Electric Light Association. Annual convention, Chicago, Ill., June 2-5.

Canadian Electrical Association. Annual convention, Fort William, June 23-25.

Electrical Contractors' Association of the State of Missouri. Annual meeting, St. Louis, Mo., July 12.

National Electrical Contractors' Association. Annual meeting, Chattanooga, Tenn., July 16.

Michigan Section, National Electric Light Association. Annual convention, Ottawa Beach Hotel, Ottawa Beach, Mich., August 19-21.

Northwest Electric Light and Power Association. Annual convention, Seattle, Wash., September 10-12.

With the Electrical Manufacturers

The Reliance Electric & Engineering Company, Cleveland, O., has ready for distribution bulletin No. 1010 illustrating and describing the type "A-S" armature-shifting design, adjustable-speed motor.

British Thomson-Houston Company, London, England. is introducing into Great Britain tungsten cluster standards for ornamental street lighting, of the type now so popular in this country.

Kerr Steam Turbine Company, Wellsville, N. Y., manufacturer of a large variety of steam turbines, has appointed F. A. Mazzur & Company, 141 Milk Street, Boston, Mass., as its New England representative.

C. H. Worcester Company, Chicago, Ill., producer of cedar poles, has found it necessary to move its offices into larger quarters. These are now located in suite 1409-10-11, Association Building, 19 South LaSalle Street.

H. W. Johns-Manville Company, Madison Avenue and Forty-first Street, New York, N. Y., is sending out a folder showing the advantages of the Audiffren-Singrun refrigerating machine particularly as a new-business getter and load equalizer for central-station systems. These machines are electrically driven and are compact refrigerating outfits for residences, restaurants, small hotels, hospitals, etc.

The Richmond Electric Company, Richmond, Va., will hereafter be known as the **Richmond Electric Works.** This company makes the R-E polyphase induction motors, which are especially adapted for increasing the central-station load because of high power-factor, low starting current necessary and guaranteed temperature rise. In these motors the Richmond patented starting coils eliminate the necessity of using compensators.

The F. W. Wakefield Brass Company, Vermilion, O., has sent out a folder appealing particularly to fixture dealers. It shows the many advantages of the Wakefield line of electric fixtures, which are built on the interchangeable plan, by means of which a great variety of styles can be kept in stock at a relatively small investment. The folder also calls attention to the Wakefield coupling or adapter for attaching a rigid pendent arm to a ceiling fixture.

The National Carbon Company, Cleveland, O., has published booklet No. 39, devoted to carbon brushes for stationary motors and generators. This is a far cry from the ordinary catalog giving as it does very complete information with regard to the use of graphite products of various kinds for dynamo-electric machinery and dealing in detail with the physical and electrical characteristics of the material involved. Copies of this booklet will be sent to those interested upon request.

A. E. Rittenhouse Company has purchased the manufacturing business of the Rittenhouse-Smith Electric Company, Scranton, Pa., and will move into its newly equipped factory at Honeoye Falls, N. Y., on April 1. The company will have greatly increased facilities for turning out its several specialties. Mr. Rittenhouse still retains an interest in the Rittenhouse-Smith Electric Company and the contracting and jobbing business will be conducted as heretofore under the management of Mr. Smith.

Frederick Rall, 19 Park Place, New York, N. Y., general sales agent for E-Z Mazda lamp-locking devices, has appointed the following territorial representatives: George C. Richards, 629 West Jackson Boulevard, Chicago, for Illinois, Indiana, Missouri, Wisconsin and Texas; W. I. Otis, 629 Howard Street, San Francisco, Cal., for California, Oregon and Washington; W. W. Geisse Company, McKnight Building, Minneapolis, Minn., for Minnesota, North Dakota and South Dakota; Raymond Ackerman, 204 Scott Building, Salt Lake City, Utah, for Utah, Idaho, Montana, Nevada and Wyoming.

The Standard Roller Bearing Company, Philadelphia, Pa., has opened an office in Indianapolis, Ind., room 1201 State Life Building, in charge of L. M. Watkin, Jr. On account of the rapidly increasing demand for the products made by this company, including annular ball bearings, taper roller bearings, ball thrust bearings, roller thrust bearings, and steel, brass and bronze balls for equipping automobiles, motor trucks, machine tools of all kinds, and for ball-bearing hanger boxes used in modern line-shafting equipment in industrial plants, it has been necessary to divide up the territory formerly covered by the Chicago office and open the new office.

Elmer P. Morris Iron Works, 90 West Street, New York, N. Y., announces that it has received within the past 30 days orders for the following iron street-lighting poles: Rochester, N. Y., 170 poles for luminous arc lamps and 65 ornamental brackets for combination trolley and luminous arc poles; Dean City, N. J., 40 poles for luminous arcs; Wildwood, N. J., 50 poles for luminous arc lamps; Geneva, N. Y., 75 poles for five-light tungsten clusters; Asbury Park, N. J., 86 five-light tungsten poles; New Brunswick, N. J., 10 single-light poles; Atlantic City, N. J., 326 poles for ornamental gas lighting. The company has also received an order for shipping to South Africa 650 ornamental railroad brackets.

Albert & J. M. Anderson Manufacturing Company, Boston, Mass., has issued bulletin No. 30, devoted to Anderson automatic time switches. This bulletin describes the various parts of the Anderson switch in considerable detail, explains its operation by means of numerous illustrations and sets forth the wide range of its adaptability. Seven types of these automatic time switches are made. Included in these classes are two-pole or three-pole switches for circuits ranging from 25 to 200 amperes. Most of the switches are designed for circuits of 250 volts or less. A high-tension oil-break time switch, suitable for voltages up to 6,600 volts, is also made. Some of the time switches are provided with a special holiday cutout and Saturday time-extension device. Others provide for double operation or for the control of two branch circuits. Switches especially adapted for the control of constant-current transformer circuits and battery-charging circuits are also made.

Record of Electrical Patents.

Issued by the United States Patent Office, March 18, 1913.

1,056,009. Automatic Cutoff Device. L. D. Crouch, Oneonta, N. Y. Closing of an electromagnet circuit permits a spring cutoff valve to close and at the same time to ring an electric alarm.

1,056,021. Coin-Controlled Telephone System. G. A. Graves, La Grange, Ill. Relates to details of the coin-box circuit.

1,056,045. Process of Manufacturing Gas. M. W. Murray, New York, N. Y., assignor of one-half to G. H. Rosenblatt. Steam and a hydrocarbon are subjected to the action of an electric arc and a catalytic agent.

1,056,051. Automatic Railway Danger-Signal. H. A. Osborn, St. Joseph, Mo., assignor of one-fifth each to W. E. Gorton, T. Courtney, R. E. Creel and G. H. Wyatt. Includes a circuit-controlling wheel, a pawl and brush.

1,056,084. Selecting Apparatus. C. E. Scribner and A. H. Adams, assignors to Western Electric Co. Consists of groups of polarized and neutral relays for a printing-telegraph receiver.

1,056,084. Incandescent-Lamp Globe Changer. C. D. Bates, Chicago, Ill. On top of the pole is a flexible head

with tipped bulb-engaging fingers and a controlling collar therefor.

1,056,098. Timing Device for Magnetos. O. H. H. Heins, Edgewater, N. J. Is mounted on the armature shaft.

1,056,104. Means for the Regulation and Control of Railway and Like Traffic. H. v. Kramer, Birmingham, England. An alternating-current inductive signaling system.

1,056,118. Method of Electrolyzing Streaming Electrolytes. J. G. Paulin, Landskrona, Sweden. The anode and cathode chambers are separated by double partitions inclosing an intermediate chamber.

1,056,119. Electromechanical Propulsion System for Trains. H. Pieper, Liege, Belgium. Each car has a separate heat engine, generator, battery and motors; the cars of the train may be electrically interconnected.

1,056,124. Electromagnetic Regulating or Controlling Means for Valves or the Like. T. J. Rorke, and E. Rorke, Barnes, England, assignors of one-third to H. S. Benson. Automatic control, including a tilting contact and mercury cups.

1,056,147. Coin Control for Motor-Vehicles. A. P. Browne, Cambridge, Mass. The ignition circuit has a gap which is opened after the vehicle runs a certain distance unless another coin in inserted.

1,056,154. Lamp-Socket. J. Darby, Summit, N. J. A pull-switch socket.

1,056,158. Cabinet. G. S. Elmquist and C. L. Elmquist, Ramsey County, Minn. Includes an electric motor driving a large wheel.

1,056,181. Electrolytic Cell and Method of Maintaining the Efficiency Thereof. W. M. Jewell, assignor to Chloride Process Co., Chicago, Ill. Horizontal type, the cathode and cathode liquor being over the heavier anode liquor.

1,056,185. Spark-Plug Demonstrator. G. F. Kreithlein and H. L. Roeger, Indianapolis, Ind. The plugs are mounted on a motor-driven crank shaft, dipped in a tank of water and then sparked.

1,056,196. Telephone-Receiver Support. F. S. Maxwell, Liberty, Ill.. A bracket on a desk stand for holding the receiver to the ear.

1,056,205. Electrical Water-Heater. A. P. Nichols, Seattle, Wash. The heating element is in a tortuous passage.

1,056,220. Electric-Circuit Cutout. H. M. Scheibe, assignor to Westinghouse Electric & Manufacturing Co. A cartridge with a heating coil and spring-pulled fuse strip.

1,056,236. Cigar-Lighter. W. Ude. St. Louis, Mo. Includes an alcohol container, a torch and an electric igniter.

1,056,239. Electric-Box Connection. F. H. Ward, Brooklyn, N. Y. For connecting conduit and gas pipe to a combination outlet.

1,056,242. Automatic Compensating Magnetic Clutch. A. W. Whitcomb, assignor to Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass. A countershaft is connected to the drive shaft through various gears each controlled by an electromagnetic clutch.

1,056,243. Double-Acting Clutch. A. W. Whitcomb, assignor to Whitcomb-Blaisdell Machine Tool Co. Relates to further details of the above.

1,056,248. Bucket. H. S. Atkinson, assignor to Hayward Co., New York, N. Y. Includes an electric motor for opening and closing the bucket.

1,056,257. Burglar and Fire Alarm. F. Carlson, Monessen, Pa. Includes a spring-controlled trigger, a fusible post and a circuit-closer for an alarm.

1,056,269. Police-Signal-Code Box. W. E. Fastnacht, York, Pa. Includes a set of selecting circuit-closing keys.

1,056,276. Advertisement-Displaying Mechanism for Cash Registers or Tills. W. R. Harvey, New Brighton, England. Electrically operated.

1,056,299. Battery-Plate Separator. H. E. Pratt, New York, N. Y., assignor to Gould Storage Battery Co. A perforated rubber sheet on each side of a pervious sheet.

1,056,300. Relay System. E. W. Preston and G. L. Nickerson, Sioux City, Ia. A symmetrical relay system for joining two long-distance telephone lines.

1,056,302. Dial-Train for Distant-Signaling Purposes. W. Rausch, Dusseldorf, Germany. A contact device for electric clock signals.

1,056,310. Electric Switch. H. J. Wiegand, Milwaukee, Wis. Operated by a reciprocating push-bar so as to give a hammer-like blow.

1,056,318. Apparatus for Magnetically Separating Materials. S. Bruck, Berlin, Germany. A spiral electromagnet extends along the inside of a cylindrical vessel.

1,056,327. Rectifier Compound. N. Fallek, assignor to Cook Railway Signal Co., Denver, Colo. The electrolyte contains sodium phosphate, asbestos, sodium silicate and water.

1,056,334. Alternating-Current Relay. J. F. D. Hoge, New York, N. Y., assignor to American District Telegraph Co. The magnet coils are in parallel circuits, so that one is leading and the other lagging.

1,056,335. Electric Sterilizer for Liquids. M. Howard, Corvallis, Oreg. Water from a faucet passes through a pipe containing transverse charged plates.

1,056,336. Bipolar Intragastric Electrode. A. G. Hurdman, Denver, Colo. For surgical use.

1,056,350. Transmitter. R. S. M. Mitchell, Syracuse, N. Y., assignor of one-half to E. A. Newcomb. Includes a diaphragm, spiral electrodes and levers on the diaphragm, for compressing the electrodes.

1,056,354. Incandescent-Lamp-Securing Means. R. W. Morgan, Bronxville, N. Y.; E. G. Morgan, executrix of said R. W. Morgan, deceased. A helical spring with lock release acts as a lamp-locking clutch.

1,056,360. Inductor Generator for Ignition Purposes. T. E. Podlesak, Brooklyn, N. Y., and H. J. Podlesak, Chicago, Ill. Includes a permanent magnet with wound and unwound polar projections and a rotating unwound inductor.

1,056,382. Method of Producing Lead Hydrate. T. G. Timby, Chicago, Ill. Consists in electrolyzing a cast lead anode in a nitrate solution.

1,056,383. Method of Recovering Lead and Silver. T. G. Timby. A double electrolytic process.

1,056,392. Insulator. C. A. Barr and J. H. Koren, Chicago, Ill. A porcelain bushing with spring-tongue clamp.

1,056,393. Storage-Battery Lamp. C. B. Bartley, assignor to G. F. Rylands. The lamp is resiliently mounted on the battery box.

1,056,401. X-Ray Tube. E. W. Caldwell, New York, N. Y. Has a recessed target with a focal surface to project the cone of X-rays through a cathode window.

1,056,402. Electric Railway Signaling Apparatus. W. J. Cook, assignor to Cook Railway Signal Co., Denver, Colo. Has signal stations along the track, each consisting of an electric signal on each side of the track.

1,056,417. Engine-Starter. P. W. Hodgkinson, Rochester, N. Y., assignor of one-half to J. C. Lombard. An electric motor turns over the engine through a clutch.

1,056,420. Make-and-Break Device. T. Hubert, assignor to American Circular Loom Co., Portland, Me. Includes a rotating arm and two contact rollers.

1,056,423 to 1,056,425. Telephony. M. L. Johnson, assignor to Corwin Telephone Manufacturing Co., Chicago, Ill. The patents relate to party lines with lockout devices and means whereby one party may reach another party on the same line.

1,056,456. Electric Furnace for Melting and Liquefying Ferro-Alloys. W. Schemmann and J. Bronn, assignors to Rombacher Hüttenwerke, Rombach, Germany. Has a submerged and a surface electrode at opposite ends of the metal bath.

1,056,459. Automatic Fire-Protection Signal System. J. E. Shepherd, Flushing, N. Y., assignor to Automatic Fire Protection Co. Includes an automatic circuit-closer and electromagnetic signals.

1,056,482. Electric Cutoff for Marine and Other Steam Engines. R. Zoppa, Montclair, N. J. Electromagnetic control for the throttle valve.

1,056,483. Tap for Multiple-Conductor Metallic-Sheathed Cables. H. E. Adams, Pittsburgh, Pa. The cable sheath is split longitudinally and its edges secured to a T junction box.

1,056,497. Wax-Melting Device. B. Bryan, Washington, D. C. Has an electric heater.

1,056,498. Outlet-Box Support. C. C. Buckels, Chicago, Ill. A bar with angular ends is screwed between the joints; surrounding and slidably adjustable on the bar is a carrier head to whose lower threaded stem the box is bolted.

1,056,511. Air-Compressing Apparatus. J. Desmond, assignor to W. S. Potwin, Chicago, Ill. The entire motor-driven outfit is inclosed in a chamber.

1,056,512. Electric Ignition System for Internal-Combustion Engines. A. Diemer, assignor to firm of Robert Bosch, Stuttgart, Germany. Has separate starting and service magnetos.

1,056,513. Meter for Measuring Elastic Fluids. A. R. Dodge, assignor to General Electric Co. A flow meter with a mercury U-tube subjected to differential pressures, one arm of the tube containing a resistance element connected to a remote electrical recording instrument.

1,056,533. Working Submarine Cables. J. Gott, assignor to Commercial Cable Co., New York, N. Y. Current impulses of opposite polarity are alternately impressed on the line, the latter being discharged after each impulse.

1,056,536. Automatic Feeding and Weighing Attachment for Hat-Body-

Forming Machines. L. Hafemann, assignor to F. P. Waring, New York, N. Y. Has an electromagnetically controlled clutch for the feed device governed by the weighing pan.

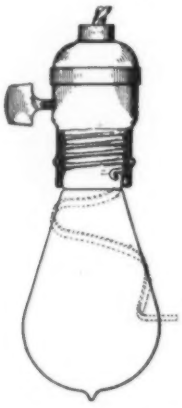
1,056,545. Electromagnetic Clutch. W. C. Huebner, assignor to Huebner-Bleistein Patents Co., Buffalo, N. Y. A circular coil about whose edge are radially movable armature sections.

1,056,559. Cable-Hanger. C. Lingle, Clinton, Mo. A spring wire saddle engaging a cable-holding bail.

1,056,584. Switch and Receptacle Box. E. Rosenkranz, New York, N. Y. The sides are formed of removable apertured plates to receive the circuit wires.

1,056,585. Electric Headlight. M. A. Ross, assignor to Pyle-National Electric Headlight Co., Chicago, Ill. A parabolic reflector with an adjustable lamp socket.

1,056,619. Sterilizing Apparatus. J. F. Armstrong, New York, N. Y., assignor of one-half to S. Ginsberg. Includes electrodes for producing ultra-violet rays.



1,056,354.—Lamp Lock.

1,056,620. Electric Rat-Trap. B. F. Ash, Valley Station, Ky. Trap doors drop the animal upon an electrocuting device.

1,056,630. Trolley. R. F. Cook, New York, N. Y. Includes a trolley-wheel protector.

1,056,637. Combined Telephone and Fire-Alarm System. W. W. Dean, assignor to Consolidated Fire Alarm Co., New York, N. Y. The alarm signals are sent over one side of the line.

1,056,638. Thermostat. W. W. Dean, assignor to Consolidated Fire Alarm Co. Closes the circuit at a predetermined temperature.

1,056,641. Process for the Manufacture of Metallic Films. F. Demel, London, Eng. A layer of silver and one of gold are electroplated on a thin adhesive material to form a substitute for gold leaf.

1,056,651. Electric Cable Connector. E. Hall Faile, New York, N. Y. A special lug and socket for multiple-strand cable.

1,056,655. Locking Device for Telephones. A. Fornander, New York, N. Y. A lock to prevent removal of the receiver from its hook.

1,056,668. Fan. H. A. Happich, Jr., New Orleans, La. A ceiling fan motor with small transverse blades on the ends of the long blades.

1,056,671. Electrically Operated Controlling Mechanism. J. C. Heintz, Cleveland, O. A time switch arrangement.

1,056,677. Switch Box. R. Hipple, Williamsport, Pa. Includes a magnetically operated switch.

1,056,679. Ceiling-Block Connector. L. F. Hopfer, Clearfield, Pa. A pendent switch and pendent lamp are connected into the same block.

1,056,681. Station-Indicator for Railway-Cars, Etc. K. A. W. Hösel, Dresden, Germany. Electrically actuated.

1,056,683. Electric Safety Lantern. H. C. Hubbell, Newark, N. J. A special arrangement for holding the lamps.

1,056,688. Centrifugal Apparatus for Pumping Air or Gas. W. Kieser, assignor to General Electric Co. Driven by a vertical motor.

1,056,709. Pump. H. J. Pollacek and W. E. Pollacek, New York, N. Y. An electrically operated sewage-level control system.

1,056,711. Crossover Insulator for Electrical Conductors. F. Schaub, Jersey City, N. J. Is composed of a base, intermediate body and cap, one having a transverse wire-seal.

1,056,725. Junction Block for Making Electrical Connections. A. K. Andriano, assignor to Direct-Line General Telephone Co., San Francisco, Cal. For connecting parallel cables by means of transverse connections in a sectional block.

1,056,739. Transformer of Electricity. J. W. Davis, St. Clair, Mo., assignor of one-fourth to C. F. Briegleb. A motor-driven commutating-type rectifier.

1,056,742. Retrieving Mechanism. J. Hollis, assignor to J. E. McLain, Canton, O. A spring-actuated drum-type trolley retriever.

1,056,498.—Outlet-Box Support.

1,056,748. Recording Mechanism. G. Wilson, Boston, Mass. Includes an electric signal.

1,056,752. Self-Controlled Pumping System. A. C. Durdin, Jr., assignor to Chicago Pump Co., Chicago, Ill. A motor-driven pump controlled by a pressure switch.

1,056,756. Station-Indicator. L. A. Minea and A. J. Zschocke, St. Paul, and S. J. Rauchwarter, Belleplaine, Minn.; said Rauchwarter assignor to said Minea and Zschocke. Has an electrically actuated roll.

1,056,759. Switch-Box and Support. W. H. Mallery, Youngstown, O., assignor of one-half to A. L. Hennessy. A sheet-metal box with special attachment lugs.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office), that expired March 24, 1913:

556,763. Telephone Switch. W. A. Moore, Brooklyn, N. Y.

556,769. Electrode for Secondary Batteries. O. Porsch, Liege, Belgium.

556,782. Secondary Battery. M. Sussmann, Neu-Ruppin, Germany.

556,788. Operating Dynamo-Electric Machines in Multiple. E. Verstraete, St. Louis, Mo.

556,823. Automatic Grounding Device for Electric Conductors. G. A. Jewett, Chicago, Ill.

556,854. Conductor for Electrical Decomposing-Tanks. J. Leith, St. Helen's, England.

556,862. Controller for Electric Motors. E. D. Priest, Schenectady, N. Y.

556,864. Trolley Support. E. B. W. Reichel, Gross-Lichterfelde, Germany.

556,865. Alternating-Current System. E. W. Rice, Jr., Swampscott, Mass.

556,866. Electric Elevator. E. W. Rice, Jr., Schenectady, N. Y.

556,870. Wire-Gauze Brush for Dynamos or Motors. A. B. Soar and F. W. Collier, London, Eng.

556,876. Clip for Trolley Wires. R. H. Beach, East Orange, N. J.

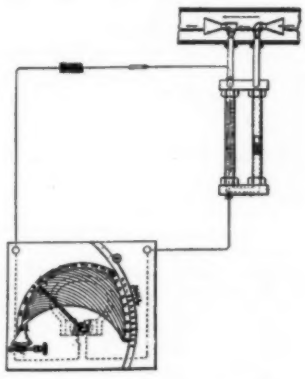
556,882. Device for Placing Electric Blasting Fuses. R. H. Elliott, Birmingham, Ala.

556,891. Support for Field-Magnet Coils. B. G. Lamme, Pittsburgh, Pa.

556,898. Electric Arc Lamp. G. C. Pyle, Indianapolis, Ind.

556,901. Thermo-Explosive Cartridge. C. H. Rudd, Chicago, Ill.

556,902, 556,903 and 556,904. Electrical Detonator. C. H. Rudd.



1,056,513.—Flow-Recording Meter.

556,941. Trolley Attachment for Electric Cars. F. S. Smith, Hartford, Conn.

556,945. Regulating Device for Controlling Working of Electromotors. R. Thury, Geneva, Switzerland.

556,946. Electric Signal Lamp. A. F. Ward, Memphis, Tenn.

556,949. Safety Device for Electric Cars, Etc. A. H. Wheeler and J. Gilbert, Warwick, R. I.

556,959. Means for Attaching and Detaching Electric Lamps. F. A. Butterfield, Detroit, Mich.

556,967. Electrical Connector. P. H. Fielding, New York, N. Y.

556,971. Insulated Support for Contact Rails. A. Hanson and J. B. Chapman, Chicago, Ill.

556,987. Electric Recording-Instrument for Ships' Compasses and Logs. C. L. Jaeger, Maywood, N. J.

557,008. Electric Trolley. G. R. Mitchell, Newtown, Pa.

557,015. Trolley for Electric Railways. P. F. O'Shaughnessy and O. T. Crosby, New York, N. Y.

557,037. Electrical Connector. B. L. Toquet, Westport, Conn.

557,048. Zinc-Support for Batteries. H. J. Brewer, New York, N. Y.

557,057. Process of and Apparatus for Producing Metallic Compounds by Electricity. E. N. Dickerson, New York, N. Y.

557,094. Converter of Frequency for Alternating Electric Currents. M. Hutin and M. Leblanc, Paris, France.